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Dr. Leonard Hill of the London Hospital is conducting a series of experiments to determine how much builder a man

SCIENTIFIC AMERICAN

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NEW YORK SATURDAY JANUARY 1st 1910

The Ed tor is always g at it receive for examination illustrated articles on subjects of it sely interest. If the phots graphs are short, the articles of set and the facts cathered is, the contributions will receive appeal attention. Accepted articles will be used for at rent or smace reads.

RETROSPECT OF THE YEAR 1909 Explorati

The year 1909 will forever be famous in the annals of scientific accompilehment as having witnessed the successful culmination of the agelong quest for the North Pole and the achievement of Commander Rob ert E Peary of the United States navy in finally reach ert E Peary of the United States navy in simally reach ing this theoretical point at the done of the world after twenty three years of practically uninterrupted endeavor will stand as the most difficult (east of geographical exploration in the history of the world it was eminently disting that Peary should be the first to reach the North Pole for among all the Arctic apploves he was easily the first in practical When he announ knowledge and experience When he announced to the world on September 5th that on April 6th 1909 he had

knowledge and superiscoe When he announced to the world on Beginseler fith that on April 5th 1980 he had reached the covered good his word was excepted with continuous and the world of this tribinant has been tacitly indicorned by the various learned sonieties throughout the world in our lessue of September 11th commenting upon the freely expressed double of Dr. Cooke claim that he also and a year earlier had reached the North Pole we wrote. The man who can look Death full in the face throughout all the cruel sufferings of a two years search for the sect of the frozen North built upon lines too holds to dentit of the slightest with the same conviction that the Danith submitting the pole at large accepted Dr. Cooke stupendous claim in a spirit of loyal belief which the control of the seculied data by a committee of the receipt of his sec-alled data by a committee of the trection of his sec-alled data by a committee of the linesting the seculied data by a committee of the linesting the contribution of the country equicity reported that Cooks statement was that thristed in a New York newspaper. But the as that printed in a New York newspaper that the copy of his notebooks contained no original astron ical observations whatsoever but only results that the documents presented were inexcusably lacking in information which would prove that the astronomical observations therein referred to were really made and that they contained no details remarding the practical work of the expedition and the sledge journey which would enable the committee to determine their reliability

By this sweeping repudiation of Dr Cooks claims the University of copenhagen has drawn the final cur-tain upon one of the most spectacular dramas of auda clous imposiure in the history of geographical re-

Second only in importance to Peary s achievement in reaching the North Pole was Lieut Shackleton e we derful journey in the Antarctic when he succeeded derful journey in the Antarctic whan he succeeded in reaching lattinde 88 degrees 28 minutes south and arrived within 111 mire of the South Pole Shankle-ton passed the very point reached by Srott in 1963 pushed on for 125 miles and was defeated in his quest pusses on 107 1/25 miles and was cereated in his quest by hunger faiture sickness and the loss of his deps and pooles. He discovered eight new and distinct mountain ranges and over one hundred mountains and ascended Mount Erebus the most southerly vol (ano The south magnetic pole was reached at 73 gegress 15 minutes

Civil Engineeric

With the single exception of the harbor at Dover the part year has not been notable for the completion of any engineering works of the first magnitude. This stupendous work by which a harbor capable of feat-

ing a whole fiest of the largest warships has been
"wrested from one of the stormiest ness in the world,
consists of an aggregate length of over two miles of
breakwater much of which is nearly 100 feet in
height from its foundation to its creet. It incloses about one square mile of area and cost so

million delays
in spits of many predictions of failure the Unitial
Blains government through its army segment, is
building the Planman Canal with a repolity segment
agains well for its opening by January int, 1915. Ower
one half of the nerowation at the Culeirar cat has one
done and if we include the work done by the French
one and if we include the work done by the French
one and if we include the work done by the French
on the contingent of the considered as two-chirals completed
On the Atlantic side between three and four miles
of the entrance channel have been completed on
the Parific side the channel is open to full depth
on the Parific side the channel is open to full depth
on about five miles At (datum the lock exeruthes to
so far done that the laying of the concrete four and
the building or the walls is well under year and over

so far done that the laying of the concrete floor and the building of the walls is well under way and over eighty thousand cubic yards are already in place The cut for the splitway has been completed and here also concreting is making good progress. The method of building the Gatun dam by hydraniic depositing is being followed with every promise of securing a per fectly watertight structure The locks which will be in pairs will be 110 feet in width with a usable length in pairs will be 110 feet in width with a mashle length of 1 000 feet. They will be provided with an extra pair of beavy mitering gates to act as collision bulk heads. Plans have been completed for an emergancy dam at the head of the locks which in the event of dam at the head of the locks which in the event of a gate being carried away will be swring across the entrance and wickets resting on girders extending from the hridge to silla below will be successively low eved until the flow of water is cut off Throughout the whole length of the canal the method of excavation by whole length of the canal the method of accaration by seam aboved has been eminently successful and during the month of March a maximum record of excavation was reached of 380.437 cnb, yards. The health of sickness and mortality is now less than in some parts of the United States. The increasing size of ships both merchant marine and naval has fed the Gramm government to undertake a great calargement says both sevenant marries and navial also socious of Cerman government to undertaks a great calargement to defend the sevenant s Baratahle Bay to Bucarde Bay It will have a free width of 200 feet a least depth of 25 feet and a high water depth of about 30 feet. The sailing distance between New York and Boston will be shortened and vessels will avoid the perits of the outside trip around Claps Cod Furthermore it will serve as the first link in a chain of interior waterways by way of the control to the control of the cont Long Island Sound New York Bay and the Ravitan and Delaware Rivers to Chesapeake Bay During the year the agitation for the construction of a waterway from the agitation for the construction of a waterway from the Lakes to the Gulf has been exceedingly active aithough the advocates of this great scheme were dis-couraged by an adverse report of the board of govern ment engineers appointed to investigate the problem This board reported that although the construction a 14 feet channel was feasible there was not suffic a 1 feet channel was feasible there was not sufficient truth in sight to warrant the expenditure to 150 000 000 that the whole project would feet The 510 000 000 that the whole project would feet The great Los Angeles Aqueduct which contains of the Panama and State Barpe canalis the largest try drautic angineering work in progress is now about half completed. This wonderful structure will be convenient gas 500 000 000 gallons of water per day from the Sitera Nevadarka Structures over the Molave for the Panama Structures and for brigation.

Throughout the year the work of the United States corresponds the prelational control card hands has been correspond to the reclassation of card hands has been

Throughout the year the work of the United States provinces in the voluntiation of orfel lands has neversinest in the evoluntation of orfel lands has exercised on with gratifying results. This work one sample on the United Process of the Western, Middle and Southwestern States. By the end of next rail to describe the term of the Process of the Proce

which has been driven through the mountain and in now being used to divert the Ginnison River litte the furtile Uncommission Valley

Now being used to direct the Gunzinea River light his facility Disconsignary Valley. The hervision total of the solid rook of Manistana Binand the needed space for two of the kurpect rathway terminal stations in existence, and building within and upon them adequate texts speed and terminal accommodation has proceeded space during the past year. The Pennsylvania Terminal is practically completed as are also the connecting time-file with New Aersey and Long Island. The present ness with New Jersey and Long Island. The present indications are that this great work will be through open for public use early in the summer of this year. The work of excavation which had been temporarily all but suspended on the New York Central Terminal all but suspended on the New York Contral Terminals has been proceeded with such yield entire [1996] that all but two tracks of the old train shed have been removed and the root excavated to about 65 feet below the street level. It is greatly to the credit of the moved of the street level. It is greatly to the credit of the first terminal transfer of the contract tracks and the contract tracks are contracted to the contract tracks and In its satiraty the downtown tanaels from Jersey CHIV. Octoband Steech saving been put in service during the year. A franchise has been granted to the company for an important extension from Sitch Avenue and Sird Street to the Grand Central Station. This important connection will enable passengers from New Engiand to the South and West to travel by rail from the Grand Central Station to the Grand Central Station to the creak thes terminal station to the trank line terminal

the Grand Contral Station to the trunk line terminal stations in Jerry City

The close of the year witnesses the practical complex close of the year witnesses the practical complex close of the Manhatan Suspansed by four out of the State River which is now spansed by four out of the State River which is now spansed by four out of the State the contable Forth Bridges in Scotland The Manhatan Fridge which is of the suspansen type has the large set carrying capacity of any inriges in the world provision being made for four rapids in task in the state of the bridge protonuced this great attracture to be bridge protonuced this great attracture to be the bridge pronounced this great structure to be thoroughly adequate to carry the loads imposed. The structural modifications recommended by the commis-sion which investigated the Queensbore Cantilever sion which investigated the Queensbore Cantilever Fridge over the Bank River with a view to decreasing the total dead and live load have been made and this structure also may be reparted as perfectly asks for the modified leading adopted. The commission of angineers which have the re-designing of the Quebec Bridge in hand are still at work upon the plane and orage in mass are still at work upon the plans can ar yet no statement has been made either as to the character or capacity of the new hridge although we understand that there is a possibility of the suspen sion type being adopted in preference to the canti-lever—a wise substitution

Naval and Military.

lever—a wise substitution.

Neval and Hilliary.

Progress curing the past year in maintern savel and military may also an interest of the past year in maintern savel and military may be added to the past year in maintern savel and military may be an expected of the among which are the South Carolina and Michigan the first all highen battleships of our navy. These vessels which are of 1500 tons displacement carry-sech such that the limitation of the residual trial maintained an average speed of 187 knots. The Dolaware and North Dakota drawfacospits of 800 tons displacement carrying each test Handelson and the North Dakota drawfacospits of the past of the past

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Scientific American

year the histor had an opportunity to make a 20-mile trip in one of these vessels, and he can testify to the remarkable case and accuracy with which the craft savered. Unquestionably submarine warfare at come into its own, and is destined to be a has at last come into its own, and is destined to be a potent influence in deciding the issue of future naval operations. Lattice masts have been fitted to all of operations. Lattice masts have been fitted to all of our battisships, and, as aftereding a five control plaintent, they have proved a decided success. The guinery of our navy continues to maintain its high excelence, and our shooting in betieved to be new second to note as the world. Mention should be made of a greatly improved British torpedo, which has a dismerter of \$1 inches and is evedited with a need of the Robin series of the state of the series and is evedited with a need of the haltship has a raised the question of increasing size of haltships has raised the question of increasing size size and draft of drydocks—a most serious consideration. During the wars a contract was left for the laws. tion. During the year a contract was let for the large drydook at Pearl Harbor, Hawali, and a new contract has also been let for the hig drydook at the Brooklyn navy yard, New York. At the present time only o largest drydocks could float the new "Wyoming" ov the sill at high water, and then with but a slight mar gin to spare

gin to spars.

The new 1-24ndh 50-caliber type gun, of the kind which is to be mousted in our \$8,000-ton ships, has shown, in the Proving Ground test, an initial valoeity of 3,000 feet per second and a mussle energy of \$5,000 feet per second and a mussle energy of \$5,000 feet per second ground in power will be the new 1-4-inch navy gun, recently completed at the Midrais works, which will fire a 1400-pound projecties with a mussle energy of 65,000 feet. The new army 1-4-inch groun will be less powerful, but it as courage, life will gun will be less powerful, but it as accurage, life will gun will be less powerful, but its accuracy life will be greater It will be capable of fring 250 rounds, as against 80 to 100 rounds which is the limit for the present high velocity 154-nch army gun. A compari-son of the sea strongth of the powers at the close of the past year places Great Britain first, the United States second, Germany third, France fourth, and Japan fifth When all ships now building are completed, Germany will be second with 250,625 tons, and the Duiled States third with 126,437 tons displacement. In dreadcoughts in stands first with seven completed, and nine building. Germany second with two compl nine building, dermany second with two completes, and nine building, and the United States third with two completed, and four under construction of pre-dreadmought battleships carrying guns of 11 inch caliber or over, Great Britain has forty nine, the United States, twenty-five, and Germany, fourteen.

Marchant Marine

The deplorable decadence of our merchant marine as continued throughout the year, and we look in has continued throughout the year, and we look in vain for any adequate evidence of the awakening of the nation to the seriousness of this pre-eminently na-tional question. As a measure of security and defense, tional question. As a measure of security and defense, the existence of an adequate number of merchan these them are as transports and colliers in time of war is vital to the efficiency of our narry. Although, during the world cruise of our feet, the world hooked on ap-provingly and applicated this evidence of mercil a strength, the people who know—the naval boards of strategy that award officers in general—most strategy and award officers in general—most sur-turangers and colliers, a veyage of this charmed, and transports and colliers, a veyage of this charmed would never be errously contemplated by our naval board, and certainly never alternoted. The signature would never be exclusive to a surboard, and certainly never attempted. The signs of decadence of our merchant marine are so clearly writ-ten that he who runs may read. Within two years the number of American steamers crossing the Pac-and capable of carrying the mails has been reducmore than one-half. The year before last the Post Office Department recommended, and the Senate Office Department recommended, and the Senate operand a bill providing for a compensation of so much per salle to steamers running to South America, the Philippines, Agana, China, and Australia, but the measure fulfed to become law. It is certain that without mach indeed accouragement American steamable likes will mere to established, and multi the construction of mail solutions on an account of the contract of the fee

e defense of its own ports. The past year will be notable in the annals of t the details of its own ports.

The past year will be noblished in the annals of transThe past year will be noblished in the annals of transmatic the passage for the first time at an average
speed of 28 Knyle an hour. This was accomplished
hist details, when the "Reservatania" covered the westmark devices brom hand to land in 4 days, 10 hours, and
11 minetal, sit an average speed of 26.05 knots. Sold,
his visual, and Ler sister, the "Loristania," are now
consisted of the fraction and pool in average weather
histories, the state of the state of the state of the state
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substitution of four-bladed propellers of amailer diam-eter for three-bladed propellers on the outer shafts of the Cunarders has not only completely eliminated what vibration there was, but by improving propeller what threation tarre was, but by improving proposes officiency has considerably increased the speed. There is no orticence that any company will ettempt to rival these vessels in speed, and probably tuture develop-ment will be along the lines of the "Olymptic" and "Titante". These moderatorspeed vessels are to be driven by a combination of reciprocating engine and turbines, the reciprocating element being used in the uranues, the reciprocating element being used in the higher ranges of expansion, in which it is more eco-nomical than the turbine. In a recent trip to Now Zealand a merchant vessel, the "Otaki," fitted with neglines and turbines, made the same average opeed as the sister ships "Orari" and "Opawa," fitted with cating engines alone. Her coal consum was 11 per cent less, and there was a reduction of 20 per cent in the water consumption, all three ships having the same boiler installation. In this combination, when reversing, the turbine is cut out and the reciprosaling engines are connected directly to the reciprossing augines are connected directly to the condensar Toward the close of the year two infer-esting devices, designed to reconcile the slow-speed demands of the propeller with the high-speed demands of the turbins, were made public. One, designed by Admirst Meville and Mr Medajins, consists of a re-duction gear of the helical type interposed between the turbins and propeller adalt. The other, designed by a German engineer, employs a form of byfausilic turbins are subjectly than the control of turbins of turbins reasonables, in which the ratio of turbins turbine transmission, in which the ratio of turbine speed to propeller speed can be rapicel indepiler. For both devices a high efficiency rate in claimed. The Curits turbine, because of its large diameter, and con-paratively low speed of revolution, has iess trouble from propalier indeficiency than the Parsons type. The loss of the "Bapublic" early in the year gave dra-matic evidence of the values of wireless tolegraphy as and a composite entry in the year gare driven the control of the value of value o pagestic material entered She was built for the Car-negle Institution at Washington, and her surveys of the ocean will form part of a comprehensive survey of the ocean will form part of a comprehensive survey of the value would be considered to the companion of the exact local magnetic variations of the companion of the exact local magnetic variations of the companion in the "Monitoria," whose built is built with large cor-ragations, the object of which is to increasant her long-tudinal atrength of the ship, without increasing the weight. The ottra cost is slight, and the carryin capacity is said to be increased from three to four per cest.

The most surprising fact in railroad development during 1969 was the continued and very considerable increase in the one of passenger and freight incomes in the one of passenger and freight incomes to be a marking of late about the 'llmin of size having been surely rached.' The adoption of the Meilet articulated system has made this increase possible three incomes of the contraction of the foundation of the foundation of the foundation of the contraction. A freight commotive for the Monntain Division of the Scale Sca way a still larger locomotive, with 6,631 square feet of heating surface and 1,163 square feet of superbesting and reheating surface, the engine alone weight SII tons, and the engine and tender together 350 tons. The most novel and important departure in the new passenger engines of the year is a huge Mailet if-wheel iconomitys, with two high-pressure 3-fainch cyl-inders driving six coupled 13-inch wheels, and two \$Hinch low-pressure strindare deviate freeinders diviting six coupled Thench wheals, and two hinch low-pressure cytificate stiving four coupled Ti-hanh low-pressure cytificate stiving four coupled Ti-hanh wheals. The total heating surface is 475 enume feet, and there are \$1,111 enumer feet of superheating and reflecting surface. The engine weight 138 tons. Such an engine will be shie to hard the exceedingly heavy American express trains at a rate of speed equal to that of the lighter European trains the quality of steel ratio darlowed from the rati mills. Reports of the Parkle Service Commission will be a surface of 1974 therefore \$1.00 to \$1.00 t

It is encouraging, also, to note a decrease in the number of railway accidents. This is due to nome measure to the increasing application of the block signaling system, which now, except for a few short distance totaling about 100 miles, extends subrotes from the Allantic to the Pacific counts. Oreat activity is also being displayed in the development of actions forms of automatic signaling, and particularly of that class of devices which acts directly on the train, and presents some virsus or activities and presents some virsus or activities of the control of the contr latest, and as far as experimental tests go the most promising, is the Brennan gyrostatic railway, which is receiving support in Europe, notably from the offi-cials of the British ermy. The little experimental car exhibited in the spring of 1907 has been followed by a exhibited in the spring of 1907 has been followed by a full-sized car, weighing 32 tons and carrying a load of 40 passengers, which has made successful trips on an experimental track. The present indications are that the system may find useful application on light railways, acting as feeders to the main steam or elec-

omy, Photography, and Chemistry.

Astronomy, Phetography, and Chemistry.
The year 1909 is astronomically memorable for the return of Halleys famous comet. On September 11th last, Dr Max Wolf of Hefdelberg discovered this Aiscorle wanderer upon one of his photographic plates in almost the exact position which the calculations of Cowell and Crommelin called for—a feat which may be regarded as a triumph of mathematical astron The comet will pass perihelion on April 20th, The comet will pass perihetion on April 20th, and will be a compicuous object in the western heavem efter sunset about the middle of May, at which time the earth will pass through a portion of the comet's tail, and the comet itself will cross the suns disk. The reappearance is therefore of exceptional interest. because it will give astronomers en opportunity of obtaining much valuable information as to the comet's

structure. The year was further signalized by the discovery of another comet by Mr. Daniel of the Princeton Observatory—the third he now has to his crofit.

On Septamber 24th, 1909, an opposition of Marzo coursed—the most favorable which astronomer and possibly have for another fifteen years on that date he planet was distant 3,5,000 miles. Nature the planet was distant 3,5,000 miles. Nature the planet was found to the planet was foun Prof Pickering, in order to settle it once and for proposed a method of signeting by mirrors, and I proposed a method of signeling by mirrors, and rrow Wood of Johns Hopkins University suggested a method of "winking" by means of black cloths on reels Neither astronomer probably believes in in-telligent life on Mars, but was actuated solely by a desire to close a wearlsome, perennial debate. The theory of hebitability depends very largely upon the presence of water on Mars. Dr Campbell, director of presence of water on Mars. Dr. Campbell, director of the Likt Observatory, made a carrial comparison last year of the spectra of the moon and Mars. He found to the spectra of the moon and Mars. He found to the spectra of the moon and Mars. We will take the spectra of the spec elive than ever

There were two exitoses of the Bun and two of the The lunar erlipses were both total and oc-ed on June 3rd and November 26th. The eclipses of the Sun, occurring on June 27th and December 12th, were respectively central and partial.

As might be expected, the radio-active elements still

Jan. were respectively ventral tain proteinments still and mainly be expected, the redirection of the cohemita. Although during the year 1509 no very demonstratements elimportant announcements. Sir William Ramsay sealed up some radium brondled in a bottle toesther with water, and observed the regular evolution of the gas (hydrogha and oxygen) at the rate of 30 cube centimeters per week. After nine months this evolution ceased simoet entirely from which Sir William Ramsay concluded that either the radium real their loss observed from which Sir William Ramsay concluded that either the radium real their loss observed from decomposing the water. This contribution is a second of the second of the second of the composing the surface of the contribution of the second o in separate giass vessels. Whichever chemist niti-mately proves to be right, the investigation is interest-ing, because it is the first attempt to apply practically the ecorroous store of energy which is contained in radium and which may be gazed when it is starded that, during distintegration, radium emits two and one-half million times as much host as an equal volume of hydrogen and oxygen combining explasively to form water. The work of Soddy for 1809 has shown

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OXTORY AND RUMAN SHEDGY.

Oxygen is the life-maintaining gas it is the most useful and the most abundant of all the elements as we still call them its combination with other substance—oxidation makes heat and that is why the sentient body is so nerally warmer than the atmos phere about it Ali animal and vegetable life depend

t pon oxygen under the suns benignant influence plants give out this gas which thus freed is respired in animal life And by the term respiration in the physiological sense we mean not only the series of acts known as hreathing i ut also that in respiration exy gen is carried from the lungs by the blood. through the minutest capillaries to the ut termost cells and the most microscopic tissuce of the body giving to it strength and warmth and life

warmth and life
In point of fact life itself in our present
knowledge is intone lyable without oxygen,
which is much more important than food to
the human economy Wilhout the latter
one may exist for months without the for
mer one must die within a few minutes
(onsider size meshabilam Normal metabo-(consider also metabolism Normal metabo-lism is the port c themical transformation of oxygen fluids and food stuffs into healthy tissues. The process is a news rest ing an ever changing one Respiration pro-vides the oxygen inguestion provides the fluids and the food stuffs. And in that in shilts y complex inhoratory the animal body these substances are combined in the con signt manufacture of frosh cells and tissues sunt manufacture of frosh cells and disames to take the place of those whi h are as con stantly dying and being removed by way of the lungs (arbon dioxide and watery vapor) and the ex retory organs

We are thus able to at pre late one of the most valuable dicia of the exciutionists that normal living is the right adjustment of rnal relations to external relations again whatever an cunt of nower an organ ists experds in any shape is the corre and equivalent of a power that was taken in from without in our physical life—as absolutely dependent upon a wholesome en vironment for wholesome existence and by far the most essential and the most benefit element which our environment afford

cent element which our environment amoreas ms is express it is here very important to note that nature does not voutsasfe us this express pure as has iempreed it for our use by combining about one jart of it with about four parts of nitrogen (an inert component) Oxygen pure is irritating and (an inert component) (Azygen jure is ifficiating and came a form of oxygen in which there atoms are considered to be (and/need into two—has in experi ments been found so caustic as to produce pulmonary in thanmations. The safest and the only good and right form of oxygen inhalation for normal restures right form of oxygen inhalation for normal restures is in ombination as it exists in the stroophers for this is the form to which during many ages the race has become adaptid it is possible that in other some creatures respired oxygen under a different combina tion than that which now obtains but in those group there were no himan beings—only such creatures as ichthyosauri and the dodo No we can live most ad vantageously most wholes mely and with the best

human results only in conformity with natural laws as no find them, and with due respect and regard to our environment

There are however abnormal states of the human body in which oxygenation is deficient by reason of disease processes and in these diseases it is sought to administer oxygen in greater proportion than obtains in the ordinary atmos phere We give it thus when oxy g nation of the blood is interfored with as in dyspnora emphysems asthn a croup whooping ough as-physia tuberculosis and pneumoinyma theerculosis and pastumo-nia and when the oxygen propor-tion in the bicod is poor as in ane mia diabetes and chlorosis (the greet at kness) Here Hayems find inga are 1 b lieve a sthoritative in such diseases as those just men ilaned oryg n mir d with a deter-minal quantity of air energises to a considerable legree the nutettive increases the appetite slightly elevates the temperature stimulates the cardiac movements and augments the bodily weight the number of red blood cells is in creased and their organic activity

is not constant, the effects may become so greater nutritive changes that are thus promot Observe now the portion of Hayens statemen I have italicised. In point of fact even in dis-Observe how the portion of Hayesin a statement which I have italized. In point of fact even in disease we do not as we could not, administer crygen pure, more-over the nume in administering helds the tabe in such manner between the parted lips that some admirture of air takes places this admirture is essential if the oxygen is to be respired at all Nor have I. for my



TOTAL BANUS GEA HISTO

part been always sure of the efficacy of oxygen in such diseases as pneumonia. I have felt that pure at mospheri alr—the colder the better its tunic proper ties—has been as efficacious as oxygen in cases us or events. Some physicians indeed go so far as to de-clare that the appearance of the oxygen tank connotes the about the connotes the source of the oxygen tank connotes

the beginning of the end for the unfortunate patient Nor does the express tank supplied for use in the sick room contain pure exyren. One of the firms which supplies this gas for the sick room informs me that their pureed exyren so per cent the remainder being nitrogen that in half the cases physicians preoring introgen matter must be made payacians pre-fer and call for tanks containing exygen compound which is made up of 60 per cent oxygen 20 per cent nitrous oxide (laughing gas) and 10 per cent nitrogen I find it now very exycopos to present certain physic-

I find it now very apropos to present (Concluded on page 16)

when the bedy unknowns to under the success groups by which the bedy unknowns to upped favording misropies, the 1dee was suggested to effect artificiality a local in crease in the temperature of those pants of the bedy which are unbested by dimeso, thus assisting of the human

In the temperature of these made of the body or embedded by disms, these satisfies the humans in the fact rangels against the merital process in a stillable medicals against the merid process in a satisfied has the supply is elicitated by the finalizer medicals of the familiar medicals of transmit which have seen in the form time immensionful. However, there was no far no possibility of seatily permeasing the hody with heat, any effects body and the second seat of heat through evaporation.

The process described in the following paragraphs fallow any part of the body to be organized.

of best through evaporation. The process described in the following paragraphs allows any part of the body to be processed and the following paragraphs allows any part of the body to be processed and the following paragraphs and processed the following paragraphs and the following paragraphs and the following paragraphs and the following paragraphs and the following paragraphs are processed and fatesative all these vital processes which are instrumental is defining the disease. The local heating is effected by measure of estimate at the following processes are precised to the following the following paragraphs are precised by the production of the processes of

finite title of \$6 to 100 milliampers thus constituted the extreme limit even in the case of small curved least twenty to first times as much current would have been required for the production of an array that the same of the production of an array that the same of the production of an array that the same of the production of the same of t

in The alternations in current direction also as to close any electrolytical effect.

The electrical vibrations generally used are to carcagir damped to yield an appreciable effect. As in to communicating tubes a liquid removed from its position of rest will oscillate to aver-decreasing distances from its position of rest so electric waves and ing as those vibrations will a new discharge date and only after an interval about two hundred times an iong as those vibrations will a new discharge date to be because the storage of the sould be reduced to about the same duration about do not the same duration at the vibrations than the same transition and the vibrations than the same formation and the vibrations than the proposed of which we recently been generated for the purposes of wireless talegraphy by means of highly sensitive appreciations. As Berlin firm has recently con a fracted an outfit for generating high propersion of constitutions of the same direction and outfit for generating high propositions as an over thempsettle modelone as a new thempsettle modelone as a new thempsettle modelone.

method

The most important part of the
outfit, vis the apparatus used to
generate the vibrations, consists of
two substantial copper electrodes
separated by a small distance beseparated by a small distance tween which the electrical charges pass in an indeed partment. These discharges produced by the high tension of protesses by use man common clearing generator connected the electrodes, and a vigratory cut connected by in parallel it, and consisting of a condenser is obtained in a condenser is obtained to the condenser in the condenser is obtained. in series. The condenser is objected by the spidents are the apparatus in



AN APPARATUR FOR PROPERTY LOUIS MANY PROPERTY.

Scientific American

which is soon competenced by a refus, which in its term exceeds the normal condition, and so on Hance the reconstant in the vibratory circuit are comparable escenses in the vib

the precurery of the preclamation of the standard preclamation for her three supplied directly, the vibrations for her three three supplied directly, the vibrations of the problem of the

body after first passing through an ammater.

This thermo-penetration outfit can be operated by direct con acction with an atternating-cur-rent devoit, the tension being-rated by a transformer before entering the generator. When continuous currently the con-tinuous currently, resembling an architect selection motor, serves to convert it into an alternating current

AN AUTOMATIC AFFARATOR FOR PROJECTING PROTURES

PRINTERS THEFTHERS

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28 ALOCTOM WITH

28 ALOCTOM WITH

Readings and Missando of Paris
have pentended an automatic projecting lanters, which they cult

the Citrows 'I consists of an
electric lanters provided with
an endiese othal or alide hold
ers, which are brought succesfriely between the condensing
hand projecting issues by activity
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to submanifestly cut off by a shutter, so that the image
does not appear on the screen until it has become motionsless

The lamps are solf-regulating and designed to a ser-

is automatically out of 19 institute, so that the manifest of the control of the

THE SCIENTIFIC AMERICAN TROPHY

THE SCIENTIFIC AREAICAN TRAPERY
The year 1909 has closed with only a sin
gie trial for the Scientific American Fly
ing Maskine Trophy That the publishers
are disappointed in this lack of interest in the use for the Scutture Assessar Fry my Machine Tropy Tent the publishers are disappointed in this lack of interest in the aport gow without saying. On the present time Mr Gleen Curties to the spot gow without saying the saying th

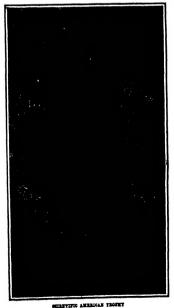
eliopters and beating-wing machines, would receive accuragement. The conditions required at first were straightnway flight of one kilometer (0 621 mile) a straightaway might of one Ricometer (0 531 miles) in a straight line. On July 4th, 1906, for Glenn Ourties carried off the Trophy by covering somewhat more than a mile in the "June Buy. In view of the slights which were then being made by French aviators: the conditions were changed for 1909 to 28 Kilometars (1854 miles) in a closed circuit, in other words 5





AN AUTOMATIC APPARATUS FOR PROJECTING PICTURES.

kilometers (3 i miles) mere than required in the later rational Contest for the Bennett Trophy Under the 1108 rules the vinnes for any page is the aviator the makes the longest and best flight in a cleased circuit during that year in 1800 Mr. Curtiss was the only competitor who came forward. He estally complied with the conditions and sucerdingly he must be re-garded as the winner of the Trophy for the year 1900



With he 300 and 300 by Clote M. Curtin.

His solicement is remarkable, because he flow double the distance required in the Bennett (up Race
The lack of entries for competition during 1986 was
seen to this, he can be competition during 1986 was
seen to this, he such lake the rules for the year of
deavond to make them so easy that any aspiring are
deavond to make them so easy that any aspiring are
written the reach. The discouraging fact runnines that
during the past year in spire of the nothine is allowed
ments of Curries and the
Wright very few new men
have come into the field for from
the competition of the seen the field of the
wright very few new men
have come into the field for from
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second of the Juvisy and by the almost daily reports of successful trials of reports of successful trials of new machines or long cross country flights by well known aviators There are fortunately a number of men in various parts of the country who are making serious experiments and it is to be hoped that great strides will be made during the year 1910 and that the competi tion for the Trophy will bring line the field a large number of

new experimenters

Possibly the present lack of
progress is due to the fact that
in America at least the aero
plane is not as vet what may be called a commercial

plane is not as ver what may be called a commercial product. It was not until the submonbile bad become a serious competitor of the bone drawn which that the Dennett and Vanderbitt copy and other automobile racing trophies were excrestly comp ted for Perhaps the history of aeronautic sport may be the same and that when secoplants are manufactured wholesalt the frigat machine will hold a recognized position in the product of the country. In Practice of the country in Practice of the country in Practice reliabilishments actively exceed in the make

we believe there are no less than a done calabilishment activity rangard in the making and soiling of aeroptance. This placing of the flytag makine upon a counserbal footing undenhedly has played its part in the same of the flytag makine upon a commercial manager freehence. For all this however there must have been popular cultimissmosp Freehence For all this however there must have been popular cultimissmosp Freehence For all this however there must have been popular cultimissmosp Freehence For all the however there is not the form of the flower than the form of the flower than the flower flower than the flower flowe his siesi and that a contest will be inaugu rated which will arouse in this country something like the enthusiasm which was evinced at Rheims

evinced at Rhelms

The conditions which will govern the con
tasts for the cup in 1910 will be announced
later. They will be so drawn as to keep
pace with the progress made last year.

A table prepared for the Archiv für Elsen bahnween states that at the commence ment of 1908 the total railway mileage of the whole world was 594 842 miles divided the whole world was 50 842 miles divided as follows America 30 92.85 Europe 199
464 Asia 56 264 Africa 185 15 and Austra 18 17 69 The coast of construction per mile has been highest in Great British and control of the coast of \$34 200

The boring conducted by the Prussian Department of Mins at (ruchow in Sitesia had to be disconlined recently upon reaching a depth of ...40 melees in view of the fast that the cost of drilling at this depth in hard sandstone was suit of proportion to the obtainable results Like the boring at Barmanhowitz in Sitesian Sitesian Conference of the Conference of the Sitesian Sitesian Conference of the Sitesian Conference of the Sitesian Sitesian Conference of the the obtainable results. Like the boring at Parum houter in Bitteat with had to be abandoned at a depth of 900 meters on ac-count of the drifts breaking the Cushew boring was undertaken for scientific puses only since mining operations are of course entirely impossible at this depth, with which the appears for hosting in-course with depth.

EXTROGRACY OF THE TEAR 1900.

(Concluded from page 5.)

without question that helium is produced from uratium as well as from redium, the amount being two milligrammes of helium annually from over a mil-

ou kilogrammes of uranium.

In photography we find an interesting attempt to resent moving pictures in colors by several inventors

Barricelli, Friese-Greene, and Urban and Smith. —Barricelli, Fries-Greene, and Urban and Smith. Curiously songs, all three investions are based upon the same principle of so rayidly presenting images and the property of the property of the property combined that the property presentations, and therefore combines them into one picture. In the same field of chronophotography must be mentioned the in-pertant application of the moving picture machine to the ultra microscope by Dr. Commandes, as applications. somewhat similar in principle to the combination of the ordinary microscope and kinetoscope made by Dr the ordinery microscope and kinetoscope made by Dr Robert E Weskins of this city over ten years ago Comandon's invention promises to be of considerable educational value in actually enabling us to see the struggles of our blood corpuscies with their microbic

struggines of our most corputers with cateral anticonsensities.

Electrical.

In view of the great advance in its officiency, the imparts lamp is entitled to be counsidered the most notable improvement of the year in the fatel of electrical ymentum and the mass however of the imparts high resultances that the product is being and in successful one from the air, which is being so successfully superior that the product is being sold in successful one partition with the supply from thill. Also the soldent expansation for fitting process, hitherto in the experience of the supply of the product is the product in the product is the commercially practical arther to the experience of the product of the product of the product is the product of the product graphic plate in hichromated goldtin presents a series of elevations and depressions, advantage of which is taken for producing, by a tracing polat, ceriliating measurement, and fluctuations in the transmission current. De Forest has improved on his system of wire-less telephops as used upon our battlenship during the world cruise, and a number of stations have been part in operation on the Great Lakes for communication. in operation on the Great Lakes for communication with steamships. Communication has been established ever the ninety miles separating Chicago from Milwaukoe, and steamers have been in touch with the shore from a distance of forty five miles. Gabet in short from a distance of forty five miles. Gabet in France has arbitred some success in the steering of a \$10 foot torpede by the wireless method previously steed by Twels to this country and Armstrong in Nacland. The torpede is driven by an internal-combinition motor, and immediately back of the explosive head is a compartment containing the wireless-controlled instruments. It is claimed that the control is effective up to five or air miles. The control is offered to the control is offered to the control is effective up to five or air miles. It is due to the control is effective up to five or air miles at all the redder was successfully operated from a small boot at editance of a little over 100 years. Mention should also be made of experimental wireless communication with a bulloon, made by the United States Army Signal Corps by means of a 100-100 chapshar-brown gard. with a balloon, made by the United States Army Signal Corps by mean of a 100-foot phospher-brones wire superacide below a balloon 1,000 free in the air Communication was kept up from the Washington station until the balloon was about all milled distant, and messages were received from Annapoles over distance of from twenty to ten miles

The spillculum of electric fraction to steam relationship to the communication of the control of the c

are apparention or electric traction to steam rati-reads continues to show gratifying results. Although no figures have been made public as to its economy, the electrical operation of the suburban tracks and terminals of the New York Central and New Haven lines has been carried on throughout the year with un-hroken success. The New York Central electric sone is being extended to White Plains, and the New Haven Company are hullding a mile of experimental over-head line beyond Stamford, preparatory to the extension of the system to New Haven The latter com-pany have else ordered two experimental freight loco pany have also ordered two experimental rivight loom mittee, and it is the intention to operate the whole the from New York to New Haven, a distance of nearly eighty miles, with electric traction both, for rivight and passenger service. The Frameyimiah Radio manufacture of the service of the properties of their tunnals and terminals in New York city. An impor-nant improvement in three engines is the removal of the motor from the axis and placing it above the frame, with a view to raising the center of gravity and reducing the stresses on the track and roadbell. Since the properties of the service of the properties of the pent of the raisedty of central power stations by the tion should be made here of a most important enlarge-ment of the capacity of central power stations by the introduction of low-presence turbines between the low-pressure cylinders and the condensers, in such power stations as are now operated by reciprocuting easilies. In the 56th firred power station of the New York sub-ways the maximum output of 5000 Microstral or the big cross-compound eaglisse has been increased to

16,000 kilowatts by interposing a Curtis turbine in

Great as was the advance made in sevenantics design 1969, it was far surpassed by the extraordinary developments of the part year, and when the history of this new act comes to be written, the senantical performances at the Rheims made, and anheavemently, will be reterred to as marking the era of practical and thoroughly controlled human flight with the heavier-thaneity machine. On July 20th, Gwrille Wright comthe contract of the contract process of the contract machine. On July 50th, Owille Wright completed the government tests at Fort layer by Sving the contract process of the process of the Here the public witnessed the astonishing sight of as-many as half e dozen seroplanes in the air at one time, the plots of which showed perfect control of their ma-chines in the gusty winds that prevailed Both Bleriot and Curtiss proved how near the acroplanes had come to reaching the 50-milean-hour mark, the former winand Curties proved how near the aeroplase had come to reaching the Schmiles-how rant, the former winning the \$11-mile race at a speed of \$47.78 mlbs per hour, and Curties bringing home to America the later-national Cup by covering 13.42 mlbs at a speed of \$47.01 miles per hour That the seropiane possesses endurance as well as speed was proved by Farman, who wen the long-distance race with a record of 111.88 miles covered in 3 hours, 4 minutes, 55.76 seconds, who went the long-distance race with a record of 111.81 miles covered in 3 hours, 4 minutes, 55.76 seconds, 111.81 miles overed in 5 hours, 4 minutes, 55.76 seconds, 111.81 miles of the meet, Farman, on Novamber Bri. et al. Morradon, 111.81 miles and 52 seconds, and alone, at the present writing, there is no indication that the Wights will make as affect to restain the cup; in must perforce be retarned to France During the Holdoof Fullow Celebration in New York, Wilbur Wright proved his faith in the reliability of his machino by fright from Governor's laised up the Hudson River to Great's Tomb and back again. Barly in October Orville Wright has as the hours, and the hudson form of the second from Juviany to Paris and back, a distance of 30 miles during which he flow shore the Bills during which he flow shore the Bills during which he flow shore the Bills during which he flow shore the property of flett, is the increased assertance with which aviation are now making their flights under unfavorable wester conditions instances of this occurred both at the Rhelma and at the Hackpool meets, when takana passed successfully through heavy thoused equalits and also drove the machine around a closed circuit in the time of a wind which was heavy snough at times to bring him aimout to a standerill. That is the property of the standard of the sta

the enterestril exceptant. In the order of the control of the cont

wann ton green currons so need tone at them.

The automobile has risked such a stage of parties that the record of improvement is confined eitherly to matters of selell—so striking novelikes have been developed surjug the year. The high-pend out is now boilt abnow toolselvedy for putting purposes.

For tearing, a limit of the 10 No paraphyrers to legislate to most the requirements of the recomp procleme, and the control of ST. La Adrich of International Marks Bactisevine, who equipped a éfoice box vita 8.45-one-power expitates producer-gas engine. Extensive cruising during the past summer prevent that the boat can cover ever 800 miles at an average speed of 8 to 8 miles at an average speed of 8 to 8 miles at an average speed of 8 to 8 miles at an average speed of 8 to 8 miles as about no one to an of past authoritic coal—a truly remarks perform on the two or three years ago, sense destined to remain what it has always been, as accordingly interesting currently. As a more it has aboven high speed, but not sufficient to enable it to win against the high-covered beat of standard struction. The factor to the control of the c gines, which won the principal race at Mousco last year over a 6214 mile course at an average speed of 3915 miles per hour

Flying-Re

Brytag-Wachlan Hanntreters.

Deputy Genei-General Simos W Hanner reports from Frankret that a limited stock company has been formed in Berlin by Isadius German industrial stock and the second of the

The Aviation Meeting at Lee Augelee.

America's first aviation meet will be held at Los
Angeles, Cal., from January 10th to 30th inclusive.
Announcement has been made that prizes to the
amount of \$45,000 will be available for aeroplane conamount of \$45,000 will be available for servicine con-text, \$12,000 (will be available for servicine con-text not yet at land, but we understight the servicine events will be for beight, speed, and endurance. Fainties over two Bleefolt monophases and two Farman Fringing over the Bleefolt monophases and two Farman Fringing over the Bleefolt monophases and two Farman Fringing two Bleefolt monophases and two Farman Fringing over the State Club of America. It offers the first opportunity Ameri-cans have had to see servojance contexts and real Syring by heavier-than-air manchines.

The Automobile Shows in New York

The authorships forcers in New York.

On New Yards are the American Motor Chr. Manschotzwer Amendation will open its annual authorships and the American American State of the New York city. This show of the American State of the York city. This show of the "millouned" manufacturers will last swelt. There are 386 ethilitors, and the total vable of the athibits in in the neighborhood of \$1,100,000. Nearly 100 ethilitors of computer vehicles have space, while the exhibitors of approximation are more namewore than every before.

The Licensed association of automatic Manufacturers will had rather touch manual show in Madison Spaces (action from January Ith to English Spaces and Spaces (action from January Ith to English Spaces) and the state of the Spaces of the Spac

Scientific American

After leavants how to fix a Curricus biplace and making syswal excellent sights at Hammondsport, N. Y., the Longact of which lasted is finantee, Charles K. Ennglison made some dering slights at H. Joseph, Mo. Perentry, as detailed below by our correspondent. The machine he is using in the same one that Mr. Ourties and at Generator's Island, New York, when the stemples to fiy there during the Hudson-Pulton celebrate. Tries after with a Mr. Landsche and the Contract of the Co tempted to fly there during the Husson-Fution cassors-tion. It is fitted with a Si-horse-power 4-cylinder water-cooled motor, and the planes have a 30-foot spread. The machine weighs some 500 pounds. The first flight at St. Joseph was made on Sunday,

mber 12th, over a circular course above the from December 18th, over a circular course above the frozons surface of Lake Contrary. After two straightaway flights of a half kilometer against the wind and a kilomester with the wind in order to test the motor, the hiphane ascended in a move storm so intense as to be hindring to the spectators. The velocity of the wind exceeded 30 miles per hour A stimona height of 40 feet was mathetained throughout the one and a of 46 feet was maintained throughout the one and a half times around the course—few miles—except when nearing the Casino, a summer opers home that just out into the lake. This forms the "serojane grave-yard" of the course. On Tuesday, December 14th, a trial in the field inside the race track was made velocity, a fast vas made over 100 miles an hour estimated velocity, a fast vas made over 100, mow, and weeds of the tafield. The machine got of the ground under these adverse conditions, but made a 100-foot flight only. A new outroverter had been put on the engins and a +böded propelier shedlitted for the 3-bådded a vosace propeller substituted for the 3-binded one. A bad spark ping gave trouble throughout the day. Later the machine was wheeled to the lake, and a start made from the ice. The aviator feared the demolishment of the meahing. a start made from the los. The aviator feared the demollshment of the machine, and hald close to the surface A plercing northwest wind swept the los, and during the two flights a speed of 32 mines per hour was made with the wind while firing near the west show: The thining was done by Mr. J. H. Hees, and the distance was measured by your corre-

spondent. Wednesday was a day of failure, owing to motor truthle and unfavorable winds, until a late hear in the affarmon, when two trials were made over the faild within the race track. The first was a very short flight, and the second resulted in bresking two support braces of the borisontal rudder. The manager of the flight appointed by the Restall Merchanta' Associated in the first series of the flight spontage of the flight spontage that the Restall Merchanta' Associated the ciation insisted that the starts be made from the field within the race track. This was an undulating surred with ice and snow, and only 1,250 fe

long.

On Thursday, after the Shinded propeller had been repinced and the old carbureter reinstalled, the machine was taken to the lake once more A stiff north west gate to the lake once more A stiff north west gate delayed situate until late in the afternoon Two flights, or rather a sories of short flights, were row flights, or rather a sories of short flights, were namerous tosoches. Only three cylinders were first part of the time, and at these intervals the machine touched the fee. The motor finally failed stingether, and the machine touched the fee. The motor finally failed discaption, and the machine was stopped so auddedly by the suplication of the brakes that it added completely around on the ite. This resulted in treaking the example of the contraction of the state of the contraction of the state of the contraction missing, and while passing through motor started missing, and while passing through ow drift two tires were thrown, locking one wheel, but notwithstanding this, the machine again rose and covered 1,000 feet. The motor picked up in the mean-time. Altogether, some remarkable feats were accom-

philabed. The flight on Sunday, December 18th, was discontinued owing to inability to see, the fast-falling move having formed for upon the stateo's geogrics. This flight was made in private, and was not witnessed by many people. Somether 18th avisiter Hamilton made On Sunday, December 18th a visiter Hamilton made have flight at 8th Joseph. He circled abover Lake Conterns for tweet minsten. The flight was witnessed by 600 interested speciators

re Your Papers; They are of P

Preserve Woor Prayers; Thory are of Permanent Value.
By Linking a little trouble, when a paper first come to hand, it may be preserved to form a permanent and articulate addition to the reading matter with which will be extracted to the reading matter with the everyment and the extractive cloth board binder, which will be sent by mapl, prepaid, for \$1.50. It has good strong covers, on which the same Senzyman Austrona, or Genzertro Azimona's Surventeurer is stamped in good, and means by which the numbers may be secrely hold as in a bound book. One pitteder may time be made serviced to the present young to be secrely beld as in a bound book. One pitteder may time be made serviced to the present of the present the secretary bodder of the present of

Correspondence.

To the Editor of the SCHENIFIC AMERICA."

To the Editor of the SCHENIFIC AMERICAN
Following closely on the heels of the article in the
SCHENIFIC AMERICAN giving the new U S. battleship Scientific Assistant giving the new U R. battleship 'North Dakota' the proved title of 'Pastest Dread-nought Afford,' there appears in the columns of a Canadian publication of the first class a statement to the effect that British 'Dreadnoughts' are known to make an average of over 28 knots an hour, while the maximum average made by the 'North Dakota' is below 28 knots an bour 'I'll the exact Aquere relating to Great British's naval

If the exact figures relating to Great Britain's naval affairs are not very generally known, may it not be that she, perhaps more wisely, prefers not to publish to the world her naval socrets, while Americans, in justifiable pride over their arbievements, are making ill-advised haste to claim the first place in the prog ill-advised haste to claim the first place in the prog-reas of naval science. We have a right to expect the perfection of accuracy in all matters treated of in the pages of the SCHENTIFIC AMERICAN M W Stanstead, Queboc.

[The "Dreadnoughts" referred to as making over 23 knots are probably the cruiser-Dreadnoughts of the "Invincible" type The "North Dakots" is of another

EFFECT OF BARTE'S ROTATION ON STRONGOPIO GARA To the Editor of the SCENTING AMERICAN I take much pleasure in reading your paper, and be-ing a railroad man, was especially interested in the

ing a rairroad man, was especially interested in the article describing the monorali car I have seen the gyroscope principle, for balancing such a car, dis-cussed numerous times, but there is one point regard ing gyroscopes which I have never seen mentioned in connection with this scheme.

It may not be of much importance, but It is neve It may not be of much importance, but it is never-theless interesting, to note that a gyrescope does not retain its balance relative to the earth, but relative to a fixed point in space In other words, it would appear that on a "mono-railroad" running north and south a car would be tilted to the west at the rate of fifteen degrees per hour, or one degree every four minutes, due to the rotation of the earth Of course, this is not fast enough to inconvenience

anything, and perhaps Mr Brennan has provided a way to overcome this difficulty, but if not, it would be interesting to hear what others have to say in regard to this.

At any rate, a solution of this problem would be have interesting and of more practical benefit than At any rate, a solution of this problem would be more interesting and of more practical bonefit than the computation of our ancestors. For the monorali appears like a great improvement over the double-rail system for economical and rapid transportation. In system for economical and rapin transportation in fact, for light, high-speed passenger and express traffic, it would seem as if there is a great future in store for the monorali.

1. Lockwood, Ohio.

face by well-driving machinery This would allow an air, food, and water supply to be maintained indefi-nitely, whether or not it should be necessary to seal nitely, whether or not it should be necessary to seal the mine for the purpose of extinguishing fires Of course, it would be necessary to equip each of these stations with telephone and possibly lighting facili-ties, and of course, with facilities for forcing air into of the pipes

one of the pipes.

I am assuming, without having made figures on the proposition, that sufficient air to supply a considerable number of men could be forced through a include in the country of the country that is considered to the country that is constant to the country that is constant as the country that is constant which would prevent such appalling caismittes as the recent one at Cherry, Ill., and with this or some similar plant be contry to be so slight that it would be precioable to carry the means into effect. The bown Syracuse, N. Y

RESIDENCE SHAFTS FOR MINES.

TO the Billior of the Strature Ora REITS.

To the Billior of the Strature Agency and as a further safety procusion in the operation of mines, I would suggest the drilling of harpe holes, as many as may be accessary, from the surface to the main arteries of the workings, up through which, in cases of diseaser such as the recent one at Cherry, Illies could be frawn to safety. Seventeon-index holes are new quite common in the oil country, and larger scane could, be child it necessary. These holes could

be located at different advantageous points, and terminate in rooms in the mines or alcoves cut at the sides of entries in such a location as to not interfere with their daily use Silings made of chains, four chains, 80 feet long, spaced equally around a circle the size of the hole, and attached to an iron ring or use sue or the hote, and attached to an irus ring or apider at their upper ends, five small circular plat forms of strong wire mesh, spaced six feet apart, in alde these chains, would make what could be termed a five-storied elevator cage that would hauf dive men

a nvestoried sevator cage that would have now men or ten boys pp at a trip.

Such a cage could be galvanized for durability, would be strong, and not weigh over 150 pounds.

There could be handholds placed under each platform for tha men to grasp to steady themselves. These cages would collapse when they would strike the bot-tom and could be quickly leaded, a man stepping on to each platform as it would be slowly raised, and ed, could be quickly holsted to the surfis A perhaps better cage could be made of strong wire mesh platforms and all intr would have to be made to descend into a sump drilled deeper than the bot-tom of the mine, so that it could be loaded as it was

The holsting drum on the surface could be operated The holsting frum on the surface could be operated by steam, air, scientic, or own home power The latter would have been invaluable at Cherry, Ill., as thare would have been ample time for even a alow-operating apparatus to have saved all able to get to it, but an electrically-driven holster would be preferable to any other Wires from the power house could be run to each holster, and proper inapaction would master the apparatus to be in working order, if it stands the medium. should be needed

should be needed

Air could be hlown down these hotes for the supply
of the men at the bottom, even if the cages were being
used, the wire mesh construction of them allowing its
passagn Water, food, oil for light, etc, could be sent
down through the holes, and even doctors with medi

cines
The holes could be left open at all times for ventilation, but if such would interfere with the working
of the fan currents and other ventilation systems of
mines, the holes tould be kept closed at the top by a
proper batter if water from the sulls would drip
report batter if water from the sulls would drip
holes could be plugged at the hotton, by means of an
""""" the case of an aimlife device which, while per"""" the case of a millist device which, while peroll well packer or similar device which, while por-fectly water tight, can be quickly removed, leaving the bole clear

I can see no reason why this plan of rescue in co of mine disasters would not be entirely practicable and effective, even in mines of one thousand or more Indiana, Pa.

The Current Supplement.

An illustrated description of the large double-devided with his above constructed over the Brite Wear to accommodate both rulerost and highrest families in building the commodate both rulerost and highrest families and the state of an article which will undombedly be read with interest by amateur mechanics. Up to a few years gow water powers were easily bought for a song Nowadays they have so definite a vatue that the matter of ascertaining brite ractual horse-power in of considerable importance Mr W T Hyna explains how this excitation is made Robert M Strong's restricted to comparison of gasoline and atcohol engines is continued. The connet families of Saturn Uranus and Neptune are discussed by H C Wilson. L H Backeland describes the use of his newly invented substance. Subscribes the use of his newly invented substance. An illustrated description of the large double-deck s the use of his newly invented substance scribes the use of his newly invested substance base-like for electrical and chemical purposes. The kineto-scope has whered a new field. It now shows us moving pictures of a world which is invisible to the naked eye and revealed only by the ultra microscope, all of which is explained in the current Supplement James Scott writes on microscopic tree fungi. The efficiency of modern aeroplanes is discussed by G Garnier on the basis of the results obtained at Rheims.

A Correction

In an article on page 462 of the Scientific American December 18th, 1909 it is stated that by the interof December 18th, 1909 It is stated that by the linterposition or a turble between the low-pressure cyclic prosection of a turble between the low-pressure cycli-ders and the condenser of the cross-compound recipro-cating surfaces in the 59th Street power station and dittional 8,000 horse-power was secured. The less should have rad an additional 8,000 kilowatts. The maximum economical output of these onetime is now \$0.00 kilowatts desciped in the reciprocating element and an additional 8,000 kilowatts in the turbuse makof D ing a total of 16,000 kilowatts or say about 22,000 horses power for the whole engine

The Municipal Art Commission of New York has just published a catalogue of the works of art belonging to the city of New York it is a book of 240 pages, and contains more than 100 lituarations reproducing the works of art scattered around the city

THE ORSAL OF SERVICE POSTURE

41 Bernard Hospice stands some \$120 feet abo e the level of the sea on a mountain pass which forms one of the principal highways between Switzer

forms one of the principal highways laid and Italy Over 20 000 per sons cross this road every year at a as mearly two thiris of this nunier a complish the journey in whiter the monks and dogs of the lagic whose mission it is to aid. these traviers may be said to be signified for many lives every

ih hosii an lalin teb one Ili oldestinstiliti ns ii Iurope Il was f und d as far is k as 962 by B mord do Menthon for the lenefit of pligrims journeying to Rome For many years after it was first erected it was subjected to fre quent allacks by I ands of mountain robbers Often tie brav monka were for ed to barricad themselves in their stronghold will stress of weather drove the i slegers as Once the host i was testroyed by fire Hr Narot on was re elved when h took its army over the Alps ir to likely in the spring of 180) His force ninbered 30000 men His fore a nin bred 40000 men and for miles thy 1 nd ill raily t fight it is way f of ty foot up the steep; itali pass offen walst deep it at w and eleon convitt the it spie I nio barra ka the great guest room wir travel is are now at eltered into a bug hospital

When first sen th monaster; when are s. on the monastery from an at hits turns point of view is disas jointing. It consists of a plain bic ket forms buildings with massive walls little or when the wind and the weight of snow in mildwinter the snow around the buildings is seron to

mid-wister the earsy around the buildings is seven to the feet deep and sometimes forms define against the selfice that rea h right up to the roof. If the exterior disappoliting the same cannot be said of the in terior. On the side reserved for it is better class of travelers there is a ray loss deling room containing a handeome piano; trea used to the monks by high Edward while, the hefromes with their gettless cut island beds are it issuence of comfort. Anyone cross ing the pass is at just feet liberty to enter the hospics and accept its hospitality. No traveler is ever turned at 12 moon and it is 14. At these mests a princular tires of aimoss ivery nation on earth may be seen than Russians dermans Fixed Turks Spaniards. then Russians Germans Figus Turks Spanlards Fuglish and prhaje two or three American tavel ors The food is plain but good and plainful and the bewrange served is the famous red wine of Flid most. After meals trax 1 rs spend their time much as they whis I ne say convension with one amount in games in reading the books in the library or in inspecting the curton in the numeen library or



The interior of the charal.

Not so long ago the hospice was put into telephonic communication with the outside world with the re-sult that the world of the monica has been lightonical and that the number of lives lost has been reduced to a minimum The monastery is connected by telep

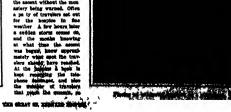


Looking for bodies in the snew after an avalanche.



St. Bernard dog with flagon of wine.

with a small jun on the Swiss side and with St Remy on the Italian side Romy on the Italian side At both these rintions ar rangements are made by which the measurery is warned of the number of persons that commence the ascent from these two places. Through these ad-vices the monks knew ex acity how many travelers are making the ascent from either side of the mountain either side of the mo anyone to attempt to make the secont without the mon astery being warned. Often a pa ty of travelers ast out



that at any given moment the mobile to number of people on the pass and their

ly a few

its sign a molecular was recurrent out three men, two without and one child had started up the path. The weather one unsettled at the time, and before a bitishing weather was unsettled at the and two hours later a let and two hours later a let of the brethren accompanie two dogs hastened down the to look for the travelers and sied by to look for the trevelers and guide them to the hospion. They have about where the travelers should be and were surprised that the dogs falled to soont them. After mearly two hours of retilizes march a dog arrived from the mea-natory. He carried a message to the effect that after they had left, a telephone message had been re-orded surprise that the travelers of the state of the travelers of the When speaking about the dogs M Bonrasois the present proved and his principal massiciant Father

M Bourgaois the present provoset and his principal assistant Father Juleo Darbellay to Moss I am is debted for the Information contained in this savides assured me that the wooderful stories that have been told about the sagnetly of the dogs are not enaggested Near the hospice is a measurement of the department of the department of the savide that the savides are another than the savides that the savides are another than the savides that the sa

In the kennels at the hospics there are at the present time fif teen trained dogs and an equal

teen trained dogs and as acqual number of bitches and young puppies. They were all born at the measurery. Their training is very simple During the number of bitches are not so busy they take the young dogs out in the valleys or hellow where there is always show One man then like down in the snow or burner than the like the state of the state

According to the traditions of the monastery the St Bernard is a cross between a Danish bull blick and a mastiff a native bill dog though at what time the breed was once established it was kept pere until 1813 when owing to the severity of the wister the most was once established it was kept pere until 1813 when owing to the severity of the wister the most were obliged contrary to their usual custom to sand out the brood bitches as well as the dogs with the result that all the females surcumbed to the cold and the monks found themselves without the means of continuing the pure breed. In this extremity a trees with the Newtonndiand was tried but at first flavor with the Newtonndiand was tried but at first flavor with the Newtonndiand was tried but at first flavor with the Newtonndiand was tried but at first flavor with the Newtonndiand was tried but at first flavor with the Newtonndiand was tried but at first flavor with the Newtonndiand was tried but at first flavor with the Newtonndiand was tried but at first flavor with the Newtonndiand was tried but at first flavor with the Newtonndiand was tried but at first flavor with the Newtonndiand was tried but at first flavor with the Newtonndiand was tried but at first flavor. According to the traditions of the monastery the

such charact the desired shortness of cent, though or peclapsis were born with the rough cents. These rough-sids were sold or given away to the inhabitants of the su ispeciages were born with the rough ceals: These rough-content and mostle were sold on even sway to the linkshittent of the surrounding valiety, whe continued to hreef them so that St. Bernard dogs seen because general in Switzentan. The full grown specimens in the kennels at the hospice are magnificent creatures of their link flows since thirty teals high at the aboutier and weigh about one handred and fifty pounds. They are exceedingly strong and can entry a man for a considerable distance Synstre they are gentle enough the puppy season when the mothers are got to reseat

stangions.

This hand of faithful creatures commonce their work in earmest at the end of September and continue looking for lost travelers right on to the middle of June which period represents the winter season on the pass. In the depth of winter not a vestige of a pair is visible. The mow drifts too present formidable obstacles. Besides there is the danger of avalanches Fogs are frequent and in storacy weather the wind rises to a burricane blowing the new thou one seys and making it impossible to see any detamen shaed.



hespice in winter Such an extraordinary in the Alps.

lons. There are over one I indred bods for travelers and they a story runpy during he win er mon its. Of n he me he save a story runpy further he win er mon its. Of n he me he save hundred persons at one time. No one is saked to lay for his a commoda ten. Vury few dr p in o h atms tox in the best if all chapiel to amount that would have by its I for similar accommodation at an ordinary h will like them. Sattery must depend to a very large or one; in on other means of support. Un espent to a very large or ear: jon cuter means or support. Un fortunately too the est ensee as very hear, for all nost all sup-plies have to one from Aorts and the neighboring villages. The monks he a cleap cellar with re they keep heir whose unif seen Fresh meat is procured from the valleys in 1 summer but for the winter the priests key up as ore of said ed meat. They also k ep a number of own in the sun ner to supply hen with milk lutter and cheese but only o e cow is reain d in the winter Wood for firing is one of the most important necessaries. Not a

nood nor naring as one of the most important necessaries. Not a from a forest on the back of horses for this purpose alone about thirty lorses are emileyed daily during the brief remmer



Entrance to the St. Bernard hospice

Indeed the menks will not hesitate to tail you that during the winter months it is impossible for an insperienced traveler to venture upon the momntain and safety negotiate the pass without reserving help Considering the perils of the road one may well ask why people venture upon it during the winter. The fact is the greater majority are poor workness going or returning from their above on the other side of the Alpin. In February and March as many as a hundred will make their way across the pass in a shape service of the serv

me that he has known the does to remain out in the mow for two days eating very little and set taking any reat or sleep.

Before the advent of the belephone the does carried a fagens of wine tied to their collars and food strapped to a saddle on their backs. Now they carry only the carry that the same that the same they carried to a saddle on their backs. Now they carry only the carry their their progress through the same for well are they trained, that they are often dispatished by them solves down the pass to secont travelers up the treacher owns path to the hougher. They always discover them and guide them to the desired haves. In the same way the mental will ablow the dags to secongraph the travelers of a stall held and the read difficult to travelers to at all held and the read difficult to travelers to at all held and the read difficult to that the body is left strapped to the hotted has the body is left strapped to the hotted at the held of the

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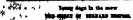
The following notes concerning the storage of California or crude oil in concrete reservoirs were recently The following notes concerning the storage of California or crude out in concrete reservoirs were reconsig-given in Concrete A 1 to 300 other lessarior illned with concrete has recently been completed at Port Rich mond Coll and one of 800 000 barrel capacity is under construction near Bakersfield. The practice is to exact rate the earth which in most fields is a sandy loam poress and very dry to about one third the det; he of the proposed reservoir. With the material removed a leves is built round the accasation having aids slopes of



Training a dog with dummies to dis

1 11/2 on both faces The bottom and sides ote often reinforced with expanded m or some equivalent Small cracks that or m of some equivalent small critics task on a at the junction of he sides and bottom and along the line between the cut and the embank ment soon become filled with sediment and are believed to permit the leakage of very little

er of such structures to Sout A number of such structures in Southern California have recently been examined and ne signs of depreciation in the quality of the con-crete were found even in those which had been in use for a considerable period



4 -

even in the equitions. High my, almost eventuels, is Theren, marked by the greety of the Preinfer and the Theren, marked by the greety of the Preinfer and the red Aldebram. Bellow it the application of the most in the country of the present of the lists of the country is a second or the star Capolia. Below are the Twins, and on the right Propora. The finish star cluster Pressage, mark the place of Cancer and on the horizon are Hydra and Lee partly rises.

The constellations in the continues are much loss months. Arth. which is this town on at once he

THE REAVERS IN SANUARY



R we watch the brighter stars on a clear winters night we may well be impressed with the notable differences in color among them What may etrike us first is that a very bright star like Sirius when low on the horison visibly hanges color from moment to moment This is like its

t violating jurety an effect of our simosphere whose retraction changing slightly as masses of air of different density are carried arross our line of slight by which clauses now one color now another to be strengthoned for an instant of its spectrum while others may be for a moment almost absent But when the sters have riesmt high and the night is clear and caim so that these disturbances are no longer perveitlis the differences of volor persist affitted by the color of the color

that of our aun) is clearly yellow Aldebaran is orange rod and Betelgeux rodder still The fainter stars whose light is too weak to show much color to

the naked eye when ex amined with the teles one show similar differences in

comena so easily ob able must be sought in the stars themselves Re cont | hysi ai research has

nade it almost ertain that we may find it in ti sir tem erature If we take a solid body such as the carbon fils ment of an incandescent lamp and heat it up grad ually to higher and higher temperatures which in this case we may easily do by increasing the electric current—we will oh serve that when it first be-comes visible its light is of a duli red. As the cur hecomes very much brighter and yellow in stead of red

If finally we apply a very high voltage and put through the lamp a heavy current whi h it can stand only a sloit time without breaking down it will give for the moment an intense while light far whiter as well as far brighter than under ordi nary conditions

Ali in anderent solida r liquids behave to the same way and careful work both in the labora tory and on theoreti al lines has led to a formula (too compil ated to be given here) which enables us to tell just h w much light of any giveo color (or wave length) will be

for way legich will be given off per square inth of surface at a given tem perature. We annot of course experiment with tem leratures as high as those that prevail upon the suc-hut there are good reasons to suppose that the formula fits the facts very losely even in this case.

We may illustrate its results by an example We may illustrate the results by an example Con-sider a star of the same temporature as this sun and suppose that we observe it (1) through doop red glass with it transmits only the extreme red rays (2) through a reliew glass transmitting only the yellow and grown light (3) by photography when the violet rays are a line effective. Now suppose for temporature and denily disclosed our formula tells as that through disclosed the constraints of the contraction of the con-traction of the contraction of the contraction of the con-traction of the contraction of the contraction of the con-traction of the contraction of the contraction of the con-traction of the contraction of the contraction of the con-traction of the contraction of the contraction of the con-traction of the contraction of the contraction of the con-traction of the contraction of the contraction of the con-traction of the contraction of the contraction of the con-traction of the contraction of the contraction of the con-traction of the contraction of the contraction of the con-traction of the contraction of the contraction of the con-traction of the contraction of the contraction of the con-traction of the contraction th red glass it vill look about seven times as bright as before through the yellow glass more than ten times and by photography some twenty times as

if on the other hand its temperature was reduced to half its initial value its light would fall off much more rapidly the red to 1/40 the yellow to 1/100 and the hine to hat 1/400 of its original amount Suppose now that we had three stars close together

suppose now that we had three stars close together in the sky whose surfaces were at the three tempera-tures just discussed. Which of them will look bright est to us will depend on how big they are and how far away Let us suppose that, viewed through the

care to avoid all sources of error and employing five different colors of light so that the comparison of the values obtained from them might serve as a check not only upon the accuracy of the observations but of the formula used in calculation

The results are highly satisfactory and form an im portant contribution to our knowledge of the stars
As is obviously to be expected from what has b

The contributions in the southwest are much less prominent. Arise which is high up can at once be recognised by the possible sensible livings formed by its density of the possible sensible in the possible contribution of the less than the contribution of the list of the less than the contribution of the list of the less and those are nose of them very hright but the planets Mars and Saturn which are close together in the less are conspicuous. The very brilliant object in the seathwest early in the evening is the planet Versus.

Pegunus and Andreaneds are well seen in the vertex present is right overhead and Canatopsia Cophess and Cygnus occupy the Mility Way as far as the northwestern horizon Uran Major and Drace are under the pole and Uran Major is coming up in the THE FLAFFU
Meroury is evening star
until the 88th when he
passes between us and the
sun and becomes a morn
ing star He is well vistible during the first half
of the month especially
about the 10th when he
sets about 6 15 P M He
is then in Carrelcorum far-

sets about 6 15 P M He is then in Capricornus far from any bright etar and should be easily identified Vanus is exceedingly bright and conspicuous especially at the beginning of the month when she sets about 8 10 P M By the end of the month she has come nearly into line be come nearly into line be-tween us and the sun and is less prominent setting about ? P M but is still far hrighter than any thing size in sight Mars is in Pisces at the beginning of the month close to Saturn and grad

THE PLANES.

ually moves eastward into Aries He is in quadra ture with the sun on the 17th and is on the meri dian at 6 P M Viewed telescopically he shows a marked gibbous phase— like the moon three days

Jupiter is in Virgo and rises about midnight being in quadrature with the sun on the opposite side from Mars on the 4th Saturn is almost opposite him in the sky in Places him in the sky in Pisces and is visible in the even ing almost till midnight

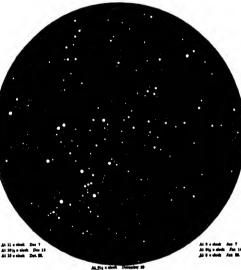
Tiennes is in contra with the sun on the 11th and is invisible throughout

the month Neptune is in opposition on the 8th and is visible all night long. He is then in R. A. 7 h 17 m 28 s deviation in 14e 25 min N and is moring 71 s to the west and 14 sec. northward daily His motion alone serves to distinguish him from the stars miless one has a telescope powerful enough to show

LAST QUARTER COOLES AT 8 A M on the 2d new moon at 7 A M on the 11th Sret quarter at 5 A. M on the 18th and full moon at 7 A M on the 18th. The moon is nearest us on the 17th, and furthest off on the 4th and 31st.

e is in conjunction with Jupiter on the 3d Ur Ene is in conjunction with Jupiter on the 3d Vrains on the 11th Mercury on the afternoon of the 12th, Venus on the 12th Satura on the 17th Mars on the 18th, and Jupiter once more on the 20th. Princeton University Observatory

The memory of the into Out. Charles W Griding, who was Admiral Downs a fine officer on beart the cruiser Chryslan at the better of iskanis, they in 1886, has been becomed by a brosse memoring tablist which has been photod on the wall or dissipation, but a Dancord Eastl Agrapheths. Med. The fraude paths apocured by parelless enfects the course by parelless enfects the course by parelless of the course of the parelless of the course of the course



HIGHT SKY: DECEMBER AND JANUARY

said the white stars are the bottest. The average temperature of those observed comes out about 11 500 deg C just about double that of the sun. The average temperature which they calculate for a

number of stars whose spectra resemble the sun e is 5000 deg —a little higher than that of the sun itself. That of the stars which resemble Arcturus in spectrum is 4200 deg and that of the reddest stars like Betelgeux about 3500 deg—lower than that of the carbons in the electric arc (The art light of course looks far bluer than most stars but this is because tooks far hiver than most stars but this is because much of its light comes from het carbon vapor which like the mercury vapor in the now familiar lamps stree off strongly colored light of its own in this case violet!

violet) A rather faint telescopic comst was discovered by Mr Daniel at Princeton on the night of Documber th I was then shout fifty million miles from se and very close to perhalics R is new slewly receding from earth and says bet will remain telescopically visible until the end of January or later. Balley a come though will placed in the evening sky in Pieces not the from Mars and Satura will probley still be unput to faint to see without a telescope shy still be unput to faint to see without a telescope.

The finest region in the starry sky is now well

Scientific American

THE RESPONDING STREET, OF TAXABLES

the present state of science, the solution of the sm of vision at a distance by means of electrical mission appears to be only a question of money rebes in this field are directed toward the utiliza-Researches in this field are directed toward the utilization of a poscular property of the element selantum, which conducts electricity more or less readily in properties to the intensity of the light which falls upon it by the property is based the system of electrical Upon this property is nessed the system of esectrical transmission of photographs which was invented by Proc. Korn, of Munich, and which has for several months been in regular operation between the offices of the Dally Mirror in London and L Illustration in Paris The general arrangement of Korn's apparatus has already been described

in the Schwiffer August be transmitted a negative film, is wrapped round a cylinder which is caused to rotate before a source of light so arranged that only a very small area of the photograph is illumi nated at a time. The pen nated at a time rine pen

A oil of light after traversing the film falls npon a
cell of selenium forming
part of an electrical cir
cuit which extends to the receiving station

cult which extends to the receiving station Owing to the property of estentum mentioned above the cur-rent which flows through this selection coil at any untant is proportional to the transparency of the nega-tive flim at the point traversed by the pectl of light at that instant. At the receiving station this flutu-ating current is employed to uncover to an extent proportional to the instantaneous strength of the curproportional to the instantaneous strength of the cur-rent a lane which conveys a beam of light upon a photographic film carried by a cylinder which rotates in synchroniam with the cylinder at the iransmitting station. Hence the part of the film on which the beam falls is illuminated and consequently blackened to a degree proportional to the transparency of the corresponding part of the original film. In short a negative at one station produces a positive picture at the other by the successive transmission of many

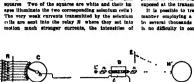
Instead of prolonging the operation in this m Instead of prolonging the operation in this manner it us suppose that it is all done at one. Let us project the image upon a sheat of selenium divided into a very large number of small cells each of which is connected with the receiving station by a separate wire It is avident that in this way the entire picture could be transmitted at once and consequently that electrical vision at a distance could be realized But in order to accomplish this illocounted or wires each connected with appropriate apparatus, would be required and the appense incurred would probably be out of all proportion to the value of the results ob-

This theoretical scheme has not formed the basis This theoretical scheme has not formed the basis of any practical experiments which have ye been brought to public notice. It was announced a few months ago that E Rubmer the well known electrican of Berlin had solved the problem and that his apparatus coulding an enormous som to constitute would be the principal attraction at the Expesition at Frensein in 1910. No details of the apparatus bow over have been published. We know that it supplys over have been published. selenium but we do not know whether it uses wire or many wires

selentum but we do not know whether it uses one wire or many wires

In his state of the problem it seems particularly interesting to not the solution proposed by two French investor's M Rignoux and Frol Fournier some of whose experiments the writer has held good fortune to winness of the problem of the pr number of little coils, and thereby uncover the same number of little mirror to an exten proportion to the strengths of the various currents Beams of light redecad or thicke interors are protected on a secu-cial part of the control of the control degrees of brightness, proportional to their of the correspond-parts of the elsect "Wife a "wely large number of calculum cells, when, coils, and mirrors it would possible to transport as picture with the dealf and plany gradations of light. The departmental desca-pinguish could be acqually under its summary and

crude, but quits convincing. The multiplicity of wires is a serious defect, which the inventors believe they have found means of remedying in their second appe-ratus which is in course of construction and is illus-trated by the accompanying diagram. At the transmitting station the rays of the luminous source L are reflected by the mirror M upon the object O the image of which is projected by the lens I npon the frame of selenium cells T (The diagram shows a frame of eight cells and an object divided into eight equal squares Two of the squares are white and th



THE RIGHGES POSTRATER STATEM OF TRESTISION

which are proportional to those of the selenium call currents to the illumination of the respective coils and to the hrightness of the corresponding parts of the

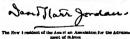
object. The problem is to transmit all of these currents through a single wire without confusion and to review them and cause them to act separately and simultaneously at the receiving station. For this purpose, Rignoux and Fournier have devised the following arrangement. The currents are conveyed to the contact pieces of the collector of from which they are taken successively by a rapidly rotating wheel which is connected with the receiving station by a

single wire

Let us for the moment disregard the question of speed of transmission and consider the means by which these successive currents are received.

At the receiving station the light of a source Lebalts of the property of the prop





phide, and then falls upon a second Nicol prism w', which is crossed with regard to the first prism. The tube is surrounded by a coll of wire B which is con nected with the wire coming from the transmitting station. Hence the currents which traverse the selec-inm cells for the transmitter flow successively through this coi' and produce an electro-magnetic ro the plane of polarization of the light which is pass-ing through the carbon dissiphide to a degree pro-portional to the illumination of the particular selenportional to the illumination of the particular selec-tum cell which is momentarily connected with the line wire causing corresponding fluctuations in the intensity of the light which emerges from the second Nicel prism of 'This beam of light of varying in tegisty halls upon the ordinder D which rotates in

synchronism with the collector O at the transmittin station, and which carries a number of mirrors Mequal to the number of selenium cells. Hence each mirror reflects a quantity of light proportional to the iliumination of a particular scienium cell and the brightness of the corresponding part of the object.
The mirrors are so arranged that the light reflected The mirrors are so arranged to the light renected by each falls on a different part of the screen E on which is thus produced a mosaic picture formed of patches of various degrees of brightness of the object posed at the transmiting station

It is possible to transmit and make visible in this

manner employing a single wire an image prod by several thousands of scientum cells? Yes "I is no difficulty in constructing a frame of 10 00 There

more solonium cells each connected by a separate wire with a collector which omprises an equal ly large numb r of con tacts Now if we remem ber that the frequency of alternation of an alternat ing current often exceeds 100 000 cycles per second it becomes evident that 10 000 currents can be col icted and transmitted successively over a single

wire in a small fraction of a second By the employment of 10 000 mirrors at the r celving station an image composed of 10 000 patches of light can be projected within the same fraction of a second The different parts of the picture will a ally be projected successively but they will appear to be simultaneous owing to the pusistence of im to be simultaneous owing to the pushelence of im pressions on the retina of the eye if the projection of the entire picture is accomplished within 1/40 second and the apparatus can be so constructed that this proc cas will be repeated indefinitely giving the appear ance of a persistent picture instead of a flecting

Hitherto we have supposed the number of mirrors to be equal to the number of selenium cells—it may be found possible however to diminish the number be found possible however to diminish the number of mirrors and to operate a can improve successively by the currents from several (cilis. This modification void dominists involve completions and difficulties in construction which we need not discuss. For the present it asfires to above that the problem of represent it asfires to above that the problem of represent it as distance by means of a single wire connecting at a distance by means of a single wire connecting at a distance by means of a single wire connecting and Fournier. In the practical realization of the effect result the invarious will have to recknow the interfer result the invarious will have to recknow the interfer result the invarious will have to recknow the interfer result the invarious will not be a first product of the invarious will not be a first product of selection but these are a first these are a first the search of selection but these are found to the search of the search of the control of electric inertia of selenium but these are familiar technical difficulties which will sooner or later be sur

DAVID STARR JORDAN

The distinction of studying natural history und Louis Agassis in the laboratories in Cambridge Louis Agessis in the laboratories in Cambridge is one to be highly appreciated and of the many eminont naturalists who were so fortunate as to re-crite their first inspiration under the guidance of that r. nowned master many if not most have cased their artificities Of the earlier students Brooks Hysti and Packard have joined the altent the control of the control Brooks Hysti and Packard have joined the silent majority Alexander Agassis Putnam Scudder and Verrill are fortunately still with us in the happy pos accision of an assured fame. At the close of the elder Agassis a career he established a summer school on Agassis a career ne established a summer action of Pechlose Idand and of those who studied there two have achieved especial distinction. Richard Rathbun the Assistant Secretary of the Smithsonian Institu-tion who is now directing the activities of a score or tion was in now otherwing the activities of a score or more of vounger men in the work of the National Museum and David Starr Jordan who presides over the destinies of the great Stanford University in Call fornia. Prof Jordan has been called to preside over the meeting of the American Association to be held this week in Boston and of him is the following brief aketch

nestrich.

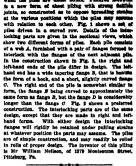
David Start Jordan was born in Oaineveille New
York on January 19th 1857 and grew up on his
there a farm in Wyoming Comity ne reiving his early
education in achools in the vitinity or his home in
1858 he entered Cornell and there devoted himself to
scientific studies developing a special interest in bor
any in which hirsten he was made instructor to his
junior year and continued to held that jace with its
was graduated with the degree of H is in the there
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Lombard Toliversity in 1872 a place which he held
for a year and then accepted the principability of
Appleton (Wis) Collegiste Institute He then entered
the Andreane School on Penfitzee Island as a student

Approxon (Wis) Collegiate Institute He time entered the Anderson School on Penficase Island as a student and lectured there on marine botany during the sum meer of 1876 It was there that he came under the influence of the elder Agassir and began his studies (Continued on sage 18)

Scientific American

nest one pile with nasther are agt to spread spe when the piles are under strain. Pictured herewis is a new form of shoot piling with strong fields is a new form of cheef pitting with strong fielding joints, an constructed in the copyonis beyonding stiming, coloris, and the construction of the construction of the with relation to each other. Fig. 3 shows a sequence pitting driven in a curred row. Details of the inter-locking parts are given in the sectional view, both show two different forms of pites. Each pite consists of a web 4, fremished with a pair of fanages forms of a web 4, fremished with a pair of fanages from all interiors with the fanages of the next adjacent pites. In the construction shown in Fig. 3, the right and in the construction shown in Fig. 3, the right and in the construction shown in Fig. 3, the right with the form of a book, and a short, alightly curved image C. The right and of the pite is conservant similar in the form of a hook, and a short, slightly curved mange. O. The right end of the pile is somewhat similar in form, the flange B being curved to approximately the same form as flange B, but the flange D is considerably longer than the flange C. Fig. 2 shows a preferred construction. The interlocking parts are of the same design, except that they are made in right and left-





A novel form of gas-main stopper is illustrated in the accompanying engraving. It consists of a facilite disphragm mounted on a collapsible spring frame, which may be expanded in the gas main by secreting which may be expanded in the gas main by serving pressure at two diametrically opposite points. The spring frame is indicated at A in the illustration, and whom in collapsed condition is allibitical or oval in form. The dispiragem attached to the frame is shown at B Connecting opposite extensities of the oval shaped spring frame A are a pair of telescoping men-bers C, to which the operating handles D and B are at tached. It will be evident that when the handle B is bert of, to which the operating handles D and B are al-teched. It will be evident that when the handle S is accepted to the several properties of the several transfer O will telescope, drawing the frame A into dir-cular form In order to provide for operating both of the handle bars simultaneously, a crosshead F is fitted to the outer end of the har D, and is provided with an aperture through which a threaded her G is adapted to pass. The har O terminates in a book, which as-termed to the several properties of the several threaded on the har G and bearing against the cross-head F serves to farm the har T outward, and accep-ted the server of the server of the server of the super into the crowler form in we the stopper is introduced into the gas main through an opening, and inclined with its lower and extending toward the sud facilities that his lower and extending toward the sud residual through the opening and when the themin and is tiphened the frame is brought to a nearly vertical position, as indicated in the drawing, thus pring cross-ties of the sent and effectivally spoping the flow of position, as indicated in this crawing, thus jving cross-wise of the main and effectually stopping the flow of gas. The inventor of this improved gas-main stopper is Mr Patrick Goodman of 257 East 133rd Street, New York city

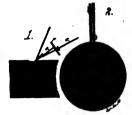


A HOVEL METEOD OF COOPERING CASES. It is customary to build casks with tapering sides, so that the hoops which bind the staves together may be jammed tightly in place. This makes it necessary to shape the staves, which entails considerable waste to since the staves, which entails considerable water of material and much trouble in assembling and bending them into position. Another disadvantages is that teapering or bujeting cask requires more room for storage than if made truly cylindrical. A novel method of overcoming these difficulties has recently been suggested. The accompanying sugarwing literates this method. Between the pieze and the hope rings are pinced, which are tapered as incidented in the sectional view. Fig. 5.

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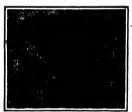
wedged into place, it is made of wire or a strip of metal that is orinkled or bent into a signag or metal that is ermilled or bent into a signal form. This lightens the construction, and pre-vides a better grip on the hoops and staves. In many trades small kups and casks of moderate size for liquids are required, but their high price and the cost of machinery for making them is probabilities for many purposes. The can't here described are especially suited to meet the requirements of such trades, because after the staves and heads are prepared they can be intuhed inside and out (including out can be minuse matter and out (including of ting the groover) in an ordinary isthe, profit ing an inexpensive cask of attractive and it ished appearance. The investor of this now construction is Mr. William Houlker of Nelson

is magnetism, not, and a member of here to plate depends upon the divisorations of plate depends and the divisoration of the desired of the control of the c



GAS-MAIN STOFFER.

tited is then filled with the from balls, which are fish on the under side to prevent them from rolling. The magnetized plate converts the balls into temporary magnets, causing them to cling to the plate and to the balls are taken out and placed in a measuring frame, as indicated in the engraving, and the number of square inches compiled by the balls is ascertified. Tables are turnished which permit of reducing the gause inches thus found to the scale of the draw, the quare inches thus found to the scale of the draw, the it will be observed that the side someher of the measuring



AREA-FIREIRG APPARATUR.

uring frame are calibrated, and the aliding cross-har in provided with vernier scales, so that the area consists of the provided with vernier scales, so that the area consists of the constant of the constan



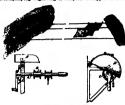
Pictured in the accompanying engraving is a novel game apparatus, which is adapted to afford consider-able recreation, as it calls for a certain amount of skill. Pictured in the a (Concluded on page 19.)





CLOTHER LINE HANGER.

The cicites line hanger which is illustrated in the



CLOTHES-LINE HANGER

ber of clothes lines at the same time, and yet permits of taking up the sizek of the lines individually or altoof taking up the size & of the lines individually or allo-gather who derived. The lines are attached at one and to a lixed support, while the other ends are con-nected to separate revie, all of which are mounted on a single shaft that may be wound up to struck it he lines teat. The shaft, which is indicated at A. is pre-vided at intervals with square sections adapted to fit the square bors of the revie B. The shaft is mounted in suitable brackets attached to a wall, and at each and is provided with a ratchet and armain, so that it may be would up to tighten the lines. Each line is provided with a hook at one end adapted to engage a



A NOVEL METHOD OF COOPERING CARES.

corresponding eye in the bar B, which is made fast to an opposite wall or other support. Whenever it is desired to take in one of the lines, or to tighten it or loosen it with respect to the others, the reel on which it is wound is moved existly until it clears the sourced it is wound as moved axisity until it clears the squared section of the shaft A, and is then free to be turned in either direction. Whenever desired, the bar E may be released from its support and the lines wound up A cover piece D may then be dropped over the reels to protect them from the weather A patent on this cottobe-line hanger has been obtained by Mr George T. Van Riper, 152 South Ocean Avenue, Freeport, N Y



DOLLED STEEL FILING.
One of the defects of sheet steel piling as heretofore constructed is that the interlocking edges which con-



BOLLED STREE PILISO.

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hand, when latt was negotiated, oxygen the state of the s cuty in scaling the world's nignest peaks should be eliminated, even Everest (24,000 feet) should be conquered, and almost any fair olimber should be able to find that flag alleged to have been planted atop Mount McKinley

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start proportion of oxygen was used in the arperiments, whether the gas was taken pure, or whether some compound of it was a small pure, or whether some compound or whether course amazing, nut it is not careptonal Trained and expert awimmers remain under water a number of minutes, when, of course, they have to hold their breath If memory serves me aright, I of celeves, they have to hold their continues of the celeves of th

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Concrete Building Blocks Scientific American Supplement 1849 contains a article on Concrete by Brymon Gunninghou The article clearly describes the proper com-position and minimal of concrete and give cleatific American Supplement 1800 gives the properties of gravel and mand to be used in

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present a helpful account of the making of coherent blocks by Exempt Marchan Selectific American Supplement 1804 gives a critical trains of the engineering value of pulsaring value of

cientific American Serpiaments 1967 and 11 give a reaction in which the various syste of reinforced concerns construction are d

mital athletics exp acress recepted athletics explor was given to some of the remore termed-study after the reson, and greaty re-lieved their distress. A well-known athlete, Mr. Holding, ran an unpaced ter of a mile in fifty seconds after be ter of a mile in fifty escends after breathing oxygen for three minutes; is the trial for the Olympian games be hed been unable to do this in less than fifty-mands. It assums he was not more been unable to up turn in your come of two seconds. It seems he was not more distressed than if he had run one hundred yards; there was, it was reported, a notable absence of that stiffness of the muscles and grogginess in the lage which muscles and grogginess in the legs which follow great exertion in running. An-other atthlets, for Just, after breathing oxygen for three minutes, ran half a mile in one minute and fitty-five seconds, alightly beating his record. I confess I am not much impressed by these achievements. I think, on the co-trary, the preliminaries to them were

caygen is given before a race, this is de-cidedly both unsels and unphysiological. Human energy is thus increased, but the increase is abnormal, as is also the ex-positive of energy. Nor set the increase is abnormal, as is also the ex-positive of energy. Nor set the half of the energy is the energy of the half oping man, as it is, grew into ma-turity with had enough hearts? Every that work is the case. But here we are advased to eliminate unnaturally a heart advased to eliminate unnaturally as a articular properties of the energy of the half of the energy of the energy of the horizon a fact of strength or a trial of endurance, capabilities are thus per-vensely and unnaturally overwought. All stimulastis—oxygen, whishy, cost, and the life—should be given not be-fore, but after, a race, a journey, or a mountain clink, in order to restore tha-fere is a matter which seems to me not altogether trivial. Bestdes, this "topings" of contestance before a race is unportunalistik. Treets of physical hravm and endurance are ligitimate outly when they are made un-legitimate outly when they are made un-legitimate outly when they are made un-

or physical brawn and engurance are legitimate only when they are made un-der normal conditions—those in which human life must ordinarily be lived. The cer normal construence—close in when the man life must ordinarily be lived. The true sportuman will countenance state on only when the contestant depends for more properties of the contestant depends for the contestant depends for the contestant depends for the contestant of the contestant of the contest course had been had between the rain-and this was permissible enough. But a shed had been built out from the rear of the last car, within which the rider kept. He was thus protected from the winds, especially headwinds, and was moreover especially headwinds, and was moreover nesisted by the suction exerted by the fast-moving train. Genuine sportamen rightly held his record to be valueless; for it was achieved under unnatural col-ditions, not under such as must be schanced and grappied with in nature.

DAVID STARR JORDAN.

MATER STARE PRESAM.
(Continued from page 1A.) of father, in the knowledge of which he now stands among the very freement in this country. In 1876 he was elected to the professorship of biology in Butter University, which plane he then held university.

* By offended in their most on upon specific to the control of their transfer of the



(Continued from page 16.) til 1872, when he was chosen to fill a similar chair to the University of Indiana, in the possession of which he continued until 1885, when he became presi-

tinued until 1835, when he became president of that university. In 1885 Leland Stanford, who had served the State of California as its Gevternative of the state of the California as its Gevternative of the state of the California as its Gevternative of the california of the California of the San the Leland Stanford Junior University, having as its object to "quality students for personal success and direct usefulness in life." This university with the richest foundation of any simil lar institution in the United States at that time, we do not be the california of the Cal

Inc. To fain's great knowledge of finite was easy's taken advantage of the the B Burau of Fisheries, and from 1877 until was acai's taken advantage of the the B Burau of Fisheries, and from 1877 until when the Stanford University is served as assistant to the U B Fish Commission, as it was then called During 1894-88 he was a U B commissioner in charge of the residual investigation, and in 1904 was given charge of certain investigation, and in 1904 was given charge of certain investigations of the residual investigation of the residual investigation of the parties, frequently visiting Alaska, Hawsil, and far-away Japan, making large collections, selections from which, especially types of new forms, have been considered to the selection of the se

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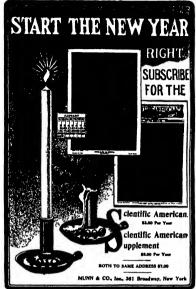
Fishes and Stanford University.

His more popular contributions to literature include the following works in book form: "Science Sketches", "Foot notes to Evolution". "Care and Cutture of Men", "The Innomerable Company", "Imperial Democracy", "The Fillosophy of Despair", "Yoles of the Science", "The Call of the Twentieth Contenty". The Bussal Exerust", "Foreitien and Anhead Exerust", "Science of Science (Concluded on popular).

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Chapter III. The Skiff Chapter Chapter VI The Modern Order

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(Concluded from page 17)
verse entitled "To Barbara." Many of
those books are collections of his lectures
and addresses before popular andiences,
for Dr Jordan has always been in demand as a speaker from the lecture plat-

Many honors have come to him Many honors have come to him. The degree of M D was conferred on him by the Indiana Medical College in 1875, that of Ph.D was given him by Butler Uniof Ph.D was given him by Butter Uni-versity in 1878, while that of L.D was conteffed on him by his alms mater in 1884, and by the Johns Hopkins Hulter sity in 1902. He is a member of many relentite societies, including the Ameri-can Philosophical Society, and during Andermy of Refences. Busides the fore-going he is a vice president of the Yarne sity Poundation for the Advancement of gie Foundation for the Advancement of Too, hing

vancoment of Science enrolled his name among its members at its second Monceting in 1882, and a year later he was advanced to the grade of Fellow The section on Biology made him its vice-president for the year 1895, but absence from the country prevented him from acfrom the country prevented him from ac-creding the office on that creation Ac-cordingly in 1900 he was again chosen, and previded over the vection at the Den-termining, delivering a reliting address on "The Flah Panns of Japan with Ob-servations on the Geographical Distribu-tion of Plakes" At the meeting held in Pallimore a year ago this 'inse' Di Joi dan was tho unanimous choice of bit se' pulific associates for the highest office in the gifl of the Association, and will take

A MEM CYMA

(Concluded from page 15)

It consists in general of a peg pro-vided with a set of recesses which are numbered 5 10 15, etc and a proair numbered 5 10 15, etc and a pro-jetting device adapted to throw a ring on this peg, so that it will hang from any one of these recesses. The project-ing device casts the ring in such a way ling distic casts the ring in such a way that il turns a complete somersault in transit, which adds to the difficulty of making the ting fall in the recent hear ling the highest number. The projecting device is shown in detail in cross sectional view it consider of a liver 4 provided at its lower and with a flat A Home-Made 100-Mile plate B adapted to receive the projectile.
The lever 4 is mounted between a pair The lever 4 is mounted between a pair of nprights (* and a spring D presses the lever upward against a stop piece. The ring II is placed on the plant II and then the lever is collect, as indicated by the doiled lines, and on being saids fily to leased throws the ring to the pog F. The revesses above referred to are indicated at G. It will be evident that Consider-able skill is required to gage the exact height to which the liver 4 minst be lifted, so that when released it will throw the ting to the desired recess mulst in operating the projector the Jup crosspiece of the fisms (* projects at each crosspires of the traint C projects at each side, and provides a rest for the finge is while the thumb is engaging the end of the lever A. The invenior of this game is Mr. Pierre V. Ericson, Chernkie Avenue, Hollis, Long Ia'and N. Y.

In a recent number of the Zelischrift Phys. Chem. T Stedberg describes some experiments on the limit of visibility of color produced by various substances in dilute solutions passing from coppor sul-phate in fuchsine and colloidal gold. It phate in furbalue and colloidal gold it is shown that in the case of colloidal par-licies the absorptive power is at first al-most independent of the size, but pro-portional to the number, of the particles On reducing the size of the particles.
On reducing the size of the particles, how
over, their absorptive power becomes less
and finally the ordinary condition of a
transparent (true) solution is situined Syedborg argues that his experiments Byedborg argues that his caparition-demonstrate the continuity of the collud-al and crystalloid states, and therefore the corporeal existence of molecules



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NEW YORK, SATURDAY, JANUARY 8th, 1910

The Editor is sivey a led to receive for examination linguistical article to enhyper of timely interest. If the photographs are charp, the articles abort, and the fact subject the contributions will repeat a standard attention. According to the contributions will repeat up a standard to the contributions will repeat to a regular space of the contributions.

A REW ERA OF THE STRAM REGINS.

y I' in the days of the perfected quadruple-expansion seam engine, anyone had ventured to criticise the type as boing very insufficient as means of cattracting the heat energy of the steam that passed through it, he would have been considered as hypercritical, to say the least had if he had ventured to predict that within a few years, by interpolar and the condemner, it would become possible to down as increased ecotomy of rour 25 to 35 per cent, and the condemner, it would become possible to down as increased ecotomy of rour 25 to 35 per cent, output of an weighte by from 70 to 100 per cent, he would have been regarded as a viliceary Yet! it is a fact that this doubling of the capacity of an engine her actually been accomplished, as staded in our editors F in the days of the perfected quadrunie-expansion actually been accomplished, as stated in our editories of December 18th, 1909, describing the remarkable

actually been accomplished, as stated in our officioned of Docember 16th, 1000, describing the remarkable work being done at the Pitty sinth Street power states of the property of the proper corresponding rise in steam pressure, which led to a gradual shandoment of the condense and a tendency gradual shandoment of the condense and a tendency to obtain the desired horse-power by working on the higher ranges of pressure. The high-pressure engine exhausting directly to the atmosphere was, of cotines, an extremely swaterful device, and the invention of the compound engine was logical and inevitable. Then followed the triple and quadruple engines, the limit of expansion being reached when the low-pressure cytin-der became too large for practical jumpones. If a cylin-der became too large for practical limit of re-diprocal-sistent down to the rull theoretical limit of re-diprocal-sistent down to the rull theoretical limit of re-diprocal-ised to the rull theoretical limit of re-diprocal-ised to the rull theoretical limit of re-dipro-serated out of all proportion to the rest of the engine; the weight would be amornous, and the losses through fritting, and be ause of the great radiating curface, would be pro-libitive. would be probibitive.

The steam turbine, on the other hand, is particu-larly adapted for accommodating the great expansion of the steam in the lower ranges of pressure, just as the reciprocating engine is better suited for develop-ing the expansion in the higher ranges. The turbine iosses in the higher ranges are largely due to the fric-tion of the rapidly revolving blades in the steam at tion or the rabitity revolving biades in the steam at its relatively high density when under high pressure, whereas akin frittion is not a serious factor during the expansion of steam in a high-pressure cylinder At the lower pressures the steam has a small density, and the skin friction losses are inconsiderable. Again, the great drop in temperature in a low-pressure cylin-dar induces rapid condensation, and greatly reduces

the efficiency
Hence, it will be seen that the reciprocating engine
working on the higher ranges of pressure and the
turbine working on the lower ranges are the complements, the one of the other, and when acting in our

ments, the one of the other, and when acting in com-bination form an ideally economical arrangement. The range of application of the new system is wide, and alteredy the turbins is winning book for usually work an agromous amount of hest which was derivery lost in the reversing rolling ongine at the steel works,

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BAPID TRANSIT BY BRLT CONVEYER.

BAPIS TRANSET ST BREE CONVEYER.

Y the action of the Board of Estimate of this city, which, on Documber Srd last, passed a resolution authorising the Public Service Commission to lay out a moving platform subway in Thirty-fourth Street between Second and Ninth Avenues, there will be given an opportunity to test a system of transportation which we have always considered to be ideally adapted for relieving the crowded traffic conditions in congented centers of large

By far the most efficient means of moving r in bulk is the bult conveyer. For transporting ma-terial that is in a more or less finely divided condi-tion, or made up of a large number of small separate tion, or made up or a large number of small separate units, such material, for finishape, as grain, coal, iron are, the belt conveyor is recognized in the in-dustrial world as having no equal—provided, of course, that the distance to which the material is to be carried and the speed are not excessive

e moving platform is practically a continuo boil conveyer for the conveyance of a large number of passengers at moderate speed. It consists of short lengths of platform, coupled together, forming an endlengths of platform, coupled together, forming an end-close chain which is kept in continuous motion. In the Thirty fourth Sitrest subway there will be four parallel rows of platform, the first, adjoining the sta-tion platform, moving at three miles an hour, the next at six miles, the third at sina miles, which fourth, which will be sullively covered from end to end with seats, will move continuously at twelve niles an hour. Entrances to the morting-platform submines an nour Entrances to the moving-pattorn sub-way will be placed at every intersecting arome or street, as the case may be The capacity will be 73,500 seated passengers per hour in one direction during the rush hour, as against 13,00 seated passengers on the eight-car express train service and 7,500 on the five-

eightear express train service and 7,500 on the five-cer local train service of the subway, and an against \$8,000 standing and seated passengers per hour of the express service and 22,500 on the local service in a recent communication to the Public Service Commission by list chief ediginer, Heavy B Seaton, the advantages of the new system are stated to be-First, a vastily intreased capacity and seats for a passengers, second, absence of the delay incurred by a visiting for trains at stations since the train is always there and constantly moving third, the fact that pas-sengers may board or leves the train at any point at sengers may board or leave the train at any point at will, and that instead of placing stations one-third of a mile apart, as on the present subway, they may be a min spart, as on the present subway, they may be placed at every cruss street, or ladeed at any inter-mediate point. Furthermore, the subway construction may take the form of a continuous areade, thus pro-viding an additional business front for display add

viding on additional quantees from our ampley now shopping purposes. Although the moving platform speed of twelve misses Although the moving platform speed of twelve misses per hour may seem somewhat allow as compared with the running speed of a subway frain, the difference is not nearly so great as might be supposed, and, indeed, over the shorter distances, is entirely in favor of the shorter distances, is entirely in favor of over the shorter distances, is entirely in fivor of the new system. The Commission's engineer fields that for all distances of test than four miles the moving platform is a quicker and move convenient mode of convenance than the local fruit service, or even quick-er than the local and express service combined, a passenger reaching Times Square Station, Forty-scool Street, from any local station south of Pour-second Street, from any local station south of Pourtreath Street quicker by the moving platform than by teems Street quicker by the moving platform than by the local and express trains of the present subway. The local trains ordinarily average, including stops, about fitted miles per bour, and twelve miles au hour during the runh of trains. If this runh hour services

about inferm intello spring, and twaiter mines at hours during the reads of trails. It is this rush hour service is compared with a pitchirum speed of tweiter mines to posteriors will have the adjustance for all distances, however, there is no trail internal to wast and however, the service of the service

Supplier in the state of the st unseer means trancises ones posses of, not, covering stra-tus in thickings are to be moved of the Lit miles of an electric trancises one posses of the Lit miles of an electric trancises one posses of the covering and the posses per son moved, me to a. 19 miles at an average space of 18% miles per hour. The cont-ration of the covering and the covering area of a contribution of the covering area of the covering area of trum 0.000 of a peansy per solit, and the capacity is of the covering area of the capacity is 4 ff, million tone. Pyritherspoor, sinceparing Radiway, including stony, from 1,54 to 118 miles ger hour, the number of ton-miles per anasym mas goes up-from 41 to 17 million, and the total explanes per ton-line, even with the laterate on capital cost of the from 0.044 to 0.000 or a posity. On those breaches of the North-Basterra Entitary that have been electricised, the train milesage has been doubted, the platerran capacity of the spain readon.

that have been electrified, the train maistage and both doubled, the platform capacity of the their station at Navasatto has been increased, and the number of signal morements has been seduced by one-blat. These advantages, coupled with the higher rate of acceleration of the electric trains, have emplied these roads to carry a trailer that would have completely examped.

carry a trame that would have completely awamped the old steam service, It is of interest to note that in commection with the alectrification of a branch of the Midland Railway, tests which are being made of the relative advantages tests which are being made of the relative advantages of direct-current and sagne-phase operation seems of the short that not only is the single-phase operation seems above that not only is the single-phase operation seems of the state of the seems of

selectrical world would be pluralment with a mass of units of exceptional visuals and intervent of exceptional visuals and intervent of exceptional visuals and intervent of exceptional visuals and the company of the plural visuals and visuals are supported to the company of the plural visuals and visuals are supported to except the plural visuals and world visuals property to or more personal, reveals all whyte's recently given to except the course, in the plural property of the control of the control of the plural visuals and the plural visuals Harris and the second

PERING PIECERIC

ENGINEERING.

There has recently been inmoded at Bath, Me, the largest wooder received over built in the United States The "Wycoming," as she has been named, is a six massed schooner of 4,750 gross tors, with a total length over all of 256 fact. Next to her in size among wooden vessels is the "William L. Douglas' with a gross ton near of 8.756.

nage of 5.768
The lamash of the battleship 'Ulah at the yards of
the New York Ship Bullding Company Canden, N J
signaliase, for the time being, the possession by the
United States navy of the larguet battleship afont
Soft this ship and the Florida now being bullt at
the Brocklyn anavy yard are of 3188 tons displacement, and each will carry for 11 186 tons displacement, and each will carry for 11 186 para

ment, and each will carry ten 13 finch guns Twumed the close of last year the four mile tunnel through the Andes on the line of the new transandine railway between Chill and Argantine was hock through 'The tunnel lies on the Chillian side of the boundary line between the two countries and comtant the summit of a new single-track road I it is expected that the tunnel will be completed and the whole line opened in the spring of the present year

Descent rate spring of the present rate.

La ha annal report to the Secretary of War Gen Murray. Chief of the Coast Artillery announced that the difficult problem of missing the waters of the race at the eastern entrance to Long Island Sound has at hat been solved By using anchors of 1500 pounds weight mines w encomerfully anchored at the great depth of 100 over 4 complete submarine equipment for the race will soon have been put in place.

place

75. Shitish Congo section of the Capoto-Cairo Rail
way 124 miles in length was formally opened on De
comber 18th it extands from the Chartrand Com
panys terminus at Froken Hill to the southers from
ther of the Congo independent State: This completes a
continuous British line of 2 147 miles north from Cape
Town Work is in progress on an additional 190 will
which will probably be completed in the autumn of
15th

The Vacquard of the British nary which has now undergrone her trials with a maximum hish power speed of a fraction under 21 knots is the fourth dreadought to be completed for the British and the British guard displacement is 19.20 tons 6th certifes ten 151a by the grant of the control of the grant of th

The Valled State Engineer Corps are engaged in surveying the route of the proposed Atlantic Coast Canal from Bosco Mass to Key West Fix The scheme calls for a canal from Boston to the coast Hough Long leisad Bound to an across New York Bay these scross New Jersey to the Delaware River House to Northcian of Chesspeth Bay and their thance to the Chesspeth Bay and their thance to the Chesspeth Bay and their thance to the Chesspeth Bay and their thanks the Chesspeth School and the Chesspeth Bay and their thanks the Chesspeth School and the Chesspeth Bay and the Chesspeth Bay and the School and the Chesspeth Bay and the Chesspeth Bay and the School and the Chesspeth Bay and the Chesspeth Bay and the School and the Chesspeth Bay and the Chesspeth Bay and the Chesspeth Bay and the School and the Chesspeth Bay and

To incilitate traffic across the huge Culsers out and to course oratin as in the was seen as the course oratin as in the was seen as the course of the course of the course of the course of the course the cut at Simpler Mont of the materials are considered at Simpler Mont of the materials of the left seed to the bridge was found on hand at Panama. The stiffening trues was made up of 4 x 8 and 6 timber and the towers were built np of 4 x 12 and 6 timber and the towers were built np of 4 x 12 and 6 timber and the towers were built np of 4 x 12 and 6 timber and the next seed to the single of 12 and 12 and 13 timber 14 timber 15 the single of 13 timber 15 timber 16 timber and have seed a tensile strongth of 170 000 pounds to the square inch

The management of several relivade have followed the lead of Janes a Ziller and the lead of Janes a Ziller and the lead of Janes a Ziller and the several period to the following the following the following the lead of the Land and they are using for this purpose the demonstration train One of the latest of these equipped by the Pennsylvania State College is being represent on a division of the Pennsylvania times and other instruction ones are following a route through our instruction ones are following a route through our of the contract of the section of the contract of the section of the contract of the section of the section

The introduction of the articulated compound type his state it pensible for the raticoda to prestly his state it pensible for the raticoda to prestly his not consist this stilled relations of existing locomotives which have become unequal to the wept demanded. The state of the state is the computation of the control of the computation of the control of the computation of

Scientific American

The Mobel price for physics has been divided this year, one-half being given to dugitelmo Marconi for his development of wireless telegraphy and the other half to Prof F K Braun of Strusburg University Germany, for his work in radio-activity

Germany, for his work in radio-activity many and the many and many and many and the property of establish wireless telegraph communication belween Japan and San Francisco by way of Hawili Alos to folegraph direct from Japan to San Francisco So far those efforts have been unaccessful although telegrams here been received in Japan from Hawaii However the transition was too uncertain to be of any commental mission was too uncertain to be of any comments.

The scont cruisers "Birmingham" and Saiem were seen recently on a cruise to test the efficiency of the sent recently on a cruise to test the efficiency of the Plant Rock Mass. The ornsters were to attrict at a maintain communication with each other over a distance of a thousand miles and with he had store over a distance of three thousand miles and with he had store over a distance of three thousand miles owing to severe sforms the test was not very successful object severe sforms the test was not very successful object severe sforms the test was not very successful object in the contract of the severe sforms the test was not very successful object.

favorable conditions

A new stam-electric locomotive is being multi in
England It comprises a status turbine which oper
state a dyname emplying current for four series wound
motors. The engine is being designed to haut or,
rows trains and will be tested in actual service so as
to show its efficiency as compared with the ordinary restam tocomotive. It is pointed out that turbe or
stam tocomotive. It is pointed out that turbe or
stam tocomotive. It is pointed out that turbe or
stam tocomotive are strength of the ordinary retent as imitiar system would were probably prove to be
of value on railways to replace steam locomotives.

of values of hallways or topules steam to compute to the water power of releaded which is going to waster to the water power of releaded which is going to waster to the water power of releaded which is going to waster to the water power of the power to the Adeptar Falls with 55 500 home power the Adeptar Falls with 55 500 home power the Adeptar Falls with 17 500 home power the Adeptar Falls would produce 3000 homes power the Bag Falls 500 to 07 000 homes power with all this hydraulic power swillable feedand would with all this hydraulic power swillable feedand would triefly particularly for use in electro-chemical industries.

A press report from England speaks of a runset shell development in wireless telephony with will make it possible within a few weeks to carry on conversation between Paris and New York As the re-ord distance over which wireless telephonic conversation to the contract of the contract of

A new type of car has been built for a line in Branch 12 and 12 a

An interesting comparison of the New York and Paris subway systems was published in a recent number of the Bieteric Ballway Journal. The following conclusions were where the late of the Control of the

SCIENCE

Former President Rossevoits African hunting trip will result in onlarging the Smithsonian collection by 6465 skins. The collection consists of hides of 343 large mammals 1 500 small mammals and 1 356 gtuffed birds. Human skulls picked up along the time of the ancient slave trial are also included.

abrient save trait are now measured.

Frod. Esegoscal, Const ron Zeppoint a mathematical and metaorological adviser is now in New York it estates that two airships will be used by Count von Zeppoint with a view to exploring the entire region within the Article Circle One will probably be at a relief station in Spitthergen while the other is on the journeys the two key ping in touch by measured wireless telegraphy. The German government will an doubterly aid the understating financially

Charood, graphite and diamonds are only different forms of one chemical circums carbon introcurcarbon that been regarded as intensité but it has any pareatly been found in caperinents which were described by the italian physicial La Ross at the last informational congress of api flort chemistry. By subjecting very jure sugar-charcoal to the intense best of the singing electric are La Ross orbitand a conceled quickly mass of graphite when this mass was cooled quickly instanced to be diamonds by their form chemical composition and physical properties.

Dr. W von Cookshkausser has invented a method of converting ordinary (oal gas into a very light gas which is sentine status valuable for fitting ballouss. The process consists in decomposing and removing all of the barry hydro at bons and nearly sail of the neckase and converting the arton dioxide into the lighter worken monoxide. The resistant product is an atmost ordinary of the sail of the sail product is an atmost barriers of the sail of the

A littees about six months old was taken to a lease as few miles defeated from its birthplace con a few miles defeated from the birthplace was said them et at liberty. It was supposed to have become habituated to its new norroundings but it retuned to its old home on the day of its release. The stace of locality and direction was onthitted still more strikingly by an old four cat which was seloned as a rivide a distance of .0 miles confined in a bag. The data instead of the confined in a bag which was the confined but their direct that the form the confined but their direct that the form it muster which was separated from that of the third by a high wooded still.

A writer in Kommo states that ht possesses a tame mappie to which he spottively offered an entinguished cagar stump. The hird began to tag the stump again to appare the changing its mind proceeded to sith the stump held in its beak over every part of its body including the inside of the wings in a very careful and methodical manner. The experiment was subsequently reported many rimes always with the same rault. The mappie is no found of lobace that it has reputatively matched a lighted cigar from his hand against his will it also picks up failten eight and the accordance of the control of the state of the control hand against his will it also picks up failten eight as the and are determined by a state of the thinks these actions have a jury ose the destruction of parasites and are determined by a statem or inherited plant must lave been used instead of thosice as an inexcited The mappies action furthermore seems to be an uncertificated.

A great number of elements was studied by Madame (urie but with the exceptions of reddium uranium and thorism she found no elementary substance possessed of a radioactivity greater than one one han dreath of that of motaliti uranium Campbell made a similar series of examinations by a more senior model and came to the coordination that potassitum the contractivity of the contractivity but had to potassitum and feeling have traved the sudfesserities but hadres over the feel and the contractivity of a great many substances. Their experiments contractivity of potassitum and rubidium. This radioactivity contractivity of the contractivity of the contractivity of the contractivity contractivity of the contractivity contra

UNIVERSAL VISE.

BY JACQUES BOYER.

Vises usually occupy fixed positions and serve merely as clamps by which the wood or other material is prevented from moving while the workman is com-pelled to adapt the position of his tools and his body to circumstances as best he may The ordinary rise no matter what tie purpose for which it is designed consists of two jaws one fixed the other movable The latter is moved toward and away from the for

The latter is moved to ware and away round to follow by a s rong square threaded a rew which turns in a nut in the fixed jaw at d in a coi iar in the movable jaw and the movem at is opposed by a flat spring which takes up the lost mo-

The universal vise invented by P Glosg en is mounted on a ball and socket joint which allows it and the object held by it to be turned in a y dir tion so that the work an be done more conven-iently and in a favorable light Wien the vise has been set in the desir d position the ball and so ket joint is locked and held motioniess joint is locked and held motioniess by a do ble joi ed jaw opera ed by a vira; termina ing in a loop in whi h h workman a foot is placed As he accompanying photograph indicates the niversal vise is de

signed primarily for the use of shoen akers It can be employed with advantage in shaping sewing nailing and alm e ery other operation involved in the making and re pairing of shoes. The shoe and the standard which

carries it can be turned into any position and instantly immobilized without touching the screw of the vise so that shaping can be done mu h better than is possible with a rotating vertical standard as the sole and the heel can be placed in the jositions most favorable

The apparat s is very simple and comprises only five large parts and two pins.

The Pacific coast i mber man facturers have taken the initiative in an important step for the promotion of

proper and conservative use of their timber supply Practically all of the large manufacturers of lumber in the Bitase of Oregon and Washington have entered into an agreement to manufacture old as well as even lengths in Society finish and strike planning lengths in Society finish and attrike planning to products. Heretotres it has been customary to manu-facture these products in even lengths only New 4t is proposed to trim the manufactured lumber to lengths is proposed to trim the manufactured lumber to of odd numbers as well as even numbers of feet



THE WHIVEBALL VIEW

the old system a considerable portion of the iumber which came to the shaping machine was wasted and this action has been taken in order to save that waste this action has been taken in order to awe that water Considerable opposition to the interovation has arisen among rekallers and consumers. The retailer contends that it is impossible for him to dispose of old length material because of the common practice in the con-struction of woods buildings claiming that the initial saving of the manufacturer is transferred to the con-sumer. This is denied heavest because of the pro-portionality small amount of old length material which will court under the new prints and because of the initer day practice of Juriar sub-Boors of rough lumber and cheating on the sides of the home before putting the finishing material in piece. Because of the con-servation element which asters into this genetics, the United States Private Service has been precuremeding the adoption of odd inequis for some time past. The Perland ellies of the Service has redestly made as investigation of the actual amount of unsecurity wash incident to the manufacture of even jumples only

investigation of the actual amount of unnecessity weeks incident to the manufacture of even lengths only and these figures above that under the old system the refuse burner commond there two per cent of the foldal continuous and the state of the control of the mul products into lengths of odd feet as well as even it would re-quire the yearly growth of timber on approximately 20 000 acres of average timber land to produce the

amount of lumber which this an nual waste represents The manufacturer is convinced that the waste is unnecessary. His greatest trouble new lies with a similar conviction on the part of the communer that odd lengths can be used as economically

The new Mexican Pan American Tailway has already been opened states the American Machinist and the line is in active operation from Ban Jeronimo as the Tubnantupoc Railway to Tapachula in Chiapaa. The Tehnantepec Railway to Tapachula in Chiapas. The extension of that line will be continued to Poet Ban Benito on the Pacific coast. There is also planned a new railway passing through parts of the States of Coabulla and Chihushus, about \$75 miles long.

MECHANICAL BOWLING MACHINE.

BY THE ENGLISH CORRESPONDENT OF THE SCIENTIFIC AMERICAN

Namero s efforts have been made from time to time to devise an echanical apparatus for reproducing hu unan action in the folivery of a bail in various games here such is required su h as basebati cricket ten ins and so forth. The problem however is somewhat abstruer insamuch as in bowling success is largely de abstruce inasmuch as in bowling success is largely de-pendent upon the brains of the bowler who resorts to varying subterfuges to complex his opposent such as varying the pace sewere and break of the ball while in the air or after it has struck the ground. To repro-duce these pocularia les by mechanical effort is no easy matter but an English engineer MY D D Fason MI MN of left minghan has perfected an ingest one active for futiliting the desired

As may be seen the apparatus comprises a tripod of steel tuhing firmly fixed to the ground by means of specialty designed anchors which correspond to the body of the bowler The ball rosts freely the bowler The ball rosts treely in a semi-spherical cup or hand carried at the outer and of a lever about the tength of the human arm with which it corresponds the low r end of this tever being ply oted to the body at the shoul

When the machine is at rest the and the bowling operation is proand the bowing operation is pro-duced by pressing this arm back ward into a horizontal position with the ball resting in the cup-chaped hand. Directly the arm is released it flies toward its normal position describing therein a quar-ter of a circle the ball being pro-pelled through the air with varying pelled through the air with varying velocity as desired toward its objecthe moving arm is produced by the action of a strong spiral spring one end of which is attached to the moving lever a short distance above the shoulder while the other end is attached to the body by an adjustable tightening screw By means of this screw the momentum imparted to the arm and

cas serve use momentum imparted to the arm and consequently the velocity of the ball can be regulated merely by altering the tension of the spiral spring. A ball delivered in this manner though fast or slow according to variation of spring tension is a straight-forward delivery—it possesses none of that swerre spin or gyration causing it to break to the right or

Inserting the ball in the "hand" of the A MERCHANNAL ROWLING MARRIED

The succides in the set of the order.

left when coming into contact with the ground and which is so bailing to the bateman. This requirement is fulfilled in an ingestion immer. The center of the cup-shaped receptacle or paim of the mechasical hand has roller or draw title its acti remaing transversely with the bottom of the cup and having its pertiberry rejecting nightly above the spherical nursine of the paim so that when the ball is inserted it reads upon the contract of the contract of the contract of the paim of the view of the contract of the contract of the paim of the contract of the contract of the paim of the contract of the contract of the contract of the of the cup will fit against the four internal sides of its containing to or. Attached to the

its containing box. Attached to the base of this outer box and at right angles therewith is a hollow spin ness or this outer box and at right angles therewith is a hollow spin die or tube mounted on a bearing which is right of the care in the same and in which it can be reviewed. It will be observed, however that the axis on which the owner, wowher he will be observed, however that the axis on which the owner, wowher he had not on which the hollow policies on which may be not to the hollow policies on which may be not to the hollow policies on the present with the hollow policies on the present with the holl of which he had a grown over which peemes a hand the ends of which held deven a reason in the principle with the holy may be which held deven a reason in the principle with the holy may be the principle with the holy may be represented in the principle with the holy may be represented by the principle with the holy may be represented by a principle with the holy may be represented by the principle with the holy may be represented by the principle with the holy may be represented by the principle with the holy may be represented by the principle with the holy may be represented by the principle with the holy may be represented by the principle with the holy may be represented by the principle with the holy may be represented by the principle with the holy may be represented by the principle with the holy may be represented by the principle with the holy may be represented by the principle with the principle with the holy may be represented by the principle with the princi

AN AUTOMATIC RAILWAY SAFETY STOP.

BY DR ALFRED GRADENWITZ

Since the service entertrophs on the Berlin Ele-tered and Deforground Rallway caused by a train reaching by a stooping signal, the German rulway afministrations have been giving increased attention to automatic braking devices for pre-reating the recurrence of such acci-dents. The automatica (Warners)

The apparatus illustrated in the dents. The apparatus (iteatrated in the secompanying figures has been adopt-ed provisionally, and is now being tested cut. Its object is to warn the engineer and fireman by visible and sound signals and set the brakes, all be-

g done simultaneously The saiety device consists of cor The safety derise consists of contact inverse monitor on the local manufactures are made pressured to the local manufactures are subject as a pressure as a subject are subject as a subject of the right-hand side of the engine, and are actuated by a permanently tightened spiral spring. In the interior of the only is a subject of the subject of the pressure of the interior of the subject of the subject of the interior of the third pressure of the subject of the subject of the tracking to the driver (1) whether the track is disengated, (3) whether the track is di

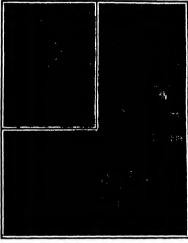
frame, immediately before the engineer's syst.

Above this repeating box is arranged a recording box, which mainly contains a clockwork, which is actuated if the train runs by some signal. This clockwork eats a roller and paper tape rotating and thus causes a dash of ot to be inserfled. Furthermore, the engine of the containing and thus causes a dash of the inserfled. Furthermore, the engine of the containing and thus causes a dash to the same of the containing and the cause of its depart, as an uniter mark, showing the signal have been duly attended to Those marks may serve as useful records in the case of its wanter.

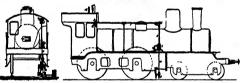
marks may serve as useful records in the case of law-stifa. On the roof of the driver's stand is mented an alarm siren, the howing sound of which is readily distinguished from that of ordinary locemotive whiteles. The same siren is used as a probating signal in the case of brakeless goods trains. On the run-sing board of the locomotive

ning board of the locomotive is arranged the brake-cock cening 5, containing, in addi-tion to the brake-cock, as click for tightening the spring above mentioned, and, accord-lagly, the whole apparents. This click, in turn, is con-tected through the draw-bar nected through the draw-bar 10 with the contact levers 6. 10 with the contact levers 6.
These two contact levers 6 on sliding over the contacts pull downward the draw-bar 10 and thus set the apparatus working. The apparatus is

actuated only in the event of both levers being struck simultaneously. This arrangement thus insures thor-ough reliability of operation



Tripping devices in operation.



rwing arrangement of track and engine contacts warning devices in eah

cituated only in the event of both levers being struck multiaceously. This arrangement thus insures thorpooned the structure of track contacts, and at the main signal, two multiaceously. This arrangement thus insures thorpooned the signal as to be lifted when the signal is closed, thus protructing beyond the rail head signal is closed, thus protructing beyond the rail head and coming into contact with the silfed

and coming into contact with the mining levers of the locomotive, whereas, in the event of the signal being drawn, they are located below the rail head, so as to avoid any contact.

In addition to these stationary ped-

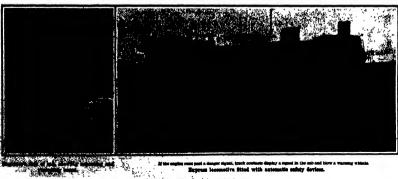
als movable pedals are provided which are readily fitted behind fish plates. with a view to warn and stop trains at

The working of the apparatus is as follows On the contact levers passing over the track contacts, the draw bar 10 is pulled down, thus disengaging the click The apparatus is merely overated by the spiral spring, and as the contact levers perform no work outside of disongaging the tightening apparat-ns, any heavy shocks are prevented, and the wear and tear is reduced consider ably

On passing over a distant signal, the contact lovers strike only a single pair of pedals situated on the track, thus closing an electric circuit, by the ac closing an electric (ricuit, by the ac-tion of which the alarm siren is sounded, while a disk bearing the in scription "distant signal" pepars in the cah signal box and a dash is mark ed on the paper tape in the repeating box. The brake cock is opened at the same time and the train is slopped auto-matically. Other to the asset in the acceptance of the same time and the train is slopped auto-matically. Other to the acceptance of the same time and the train is slopped auto-Owing to the auto ongagement of the brakes, the driver is in a position himself to throw the ap-paratus out of goar, and to continue his journey On a closed main signal being po

over, the contact with the first pair of pedals produces an effect, as above stated, during a very short time which second pair of track contacts in fact, this second contact further disengages

this accord contact further disengages the tiles, thus opening completely the braking cox and producing a rapid braking At the repeating box appears a disk with the inscription "main signal," while at the same time a dot is marked in the recording box in addition to this, a checking lead is broken. The second contact also causes the amoratum to also causes the apparatus to become locked up, so that the engine driver is no longer in a position himself to throw the apparatus out of gear, be-fore the train guard has re-



une part a danger signal, truck contacts display a signal in the one and bi Express locamotive Sited with automatic anduty devices.

FRICTION

AT RAILWAY CURVES.

BY J. F. SPRINGER.

When two material surfaces are in contact with each other, there are two distinct methods of with drawing points of contact from each other Consider such points to be extremely small plane areas. Thus, let Fig. I represent a highly magnified sectional view het Fig I represent a nignly magninous sectional view of two consisting points. All represents the infinitesimal plane area. (First) The surfaces may be with drawn from each other by moving C or D (or both simultaneously) in a direction perpendicular to tha plane represented by AB. This gives rise to what is termed rolling friction (Second) Withdrawal may be effected by moving C or D (or both simultaneously) in any one of the directions lying in the plane repr sented by AB. Thus, the movement may be sions AB The direction is immaterial, provided it is in the tiny rise to sliding friction

Now material applaces are not perfectly amonth When in contact under pressure, the projecting parti-cles interiork with each other--as idealized in Fig 2 dily is seen that movement in th () H would lend to shear off the large projections 1, 2, 3 4, while movement in the directions B, F would tend to shear off merely the interlocking protuberances of the large projections. That is to say, sliding fric-tion involves abrasion of the principal projections, while rolling friction relates merely to proje projections Consequently, it is not difficult to comprehend that sliding and rolling frictions belong to different orders of magnitude. In fact the one kind of friction is a most important consideration in me-chanical angineering, while the other is usually norti-

it is easily seen that the movement sions AB pro-It is easily seen that the movement along AB pro-duces what we all understand by sliding friction, but perhaps some may healtate at considering perpendicu lar withdrawal as rolling friction. Consider Fig. 3. Here the wheel is rolled in the direction given by the serve of the waser is rotted in the direction given by the arrow of The removal of the points contacting at A is office ted by the change of the instantaneous center of rotation from A4' to the next point BB' [See arrior 'Some Principles of Bail Bearing Design' in Sorra "Some Frinciples of Hall Bearing Design" in Betra Title Assucks for November 6th, 1939 1 in mak-ing this change, A moves perpendicularly away from A' Likewise B approaches B' perpendicularly And so on throughout the roll—the points of contact ap-proach and recede from each other perpendicularly to the surfaces of contact

Now it will not be very hard to see that any move-ment of withdrawal that is oblique is really a compound of the perpondicular and parallel movements. We may provisionally assume that in so far as it is

We may provisionally assume that in so far as it is parallel it is a rolling friction, and that in so far as it is parallel it is a liding one. That there are such compound frictions may be seen by committing the article to which reference has airward been made. Now two very important exonnic questions arise in connection with frittion. First, friction severe the incenticing parts. This is a matter of very confidenable significances descond, friction countempower in performing this abrasion. In some cases, this becomes a matter of still greated as a matter of still greated as a matter of still greated and the still provided the stil waste of the power used in accomplishing this destruc-

These two factors have, perhaps, been more or loss recognized almost from the beginning of the age of machinery But it is only in comparatively recent years that their vitai importance has begun to come to tha fore. In every direction in the machine world this is testified to at the present time by the intro-duction of ball and roller bearings Those serve—with duction of ball and roller bearings These serve—with more or less perfection—to accomplish the exchange of aliding for rolling friction in the railway world, the antifriction movement is attested by the fact that large outlays are being made to sliminate the friction at curves. Roduction of time is no doubt also in view But the railroads cortainly have in view the connumic gain to be derived from the avoidance of that excessive wear on rall and wheel which occurs when round ing a curve, and the money advantage in saving the sleam power wasted in effecting the wear and tear

steam power waster in stretching to vear and user. That railway curves give rise to a very excessive amount of friction may be understood from the amount of war occurring at a certain curva in the "subway" of the Boaton Rievated Railway Carbon-steel rails were replaced at a certain point, on the average, every forty four days. The amount of wearing down on the heads of these rails was about three-quarters of an inch As to what happened to the wheels in accom-pliability this wear, no one has any exact information. But it must have been very considerable. Three-quarters of an inch was not worn off the rail head with-out a corresponding effect on the wheels and trucks.

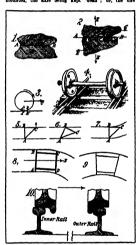
What happened at this curve is happening. In

greater or less degree, upon all curves, wherever located. It is a matter of interest and importance, then. cated. It is a matter of interest and importance, then, to consider more particularly the causes of friction at railway curves

Three prominent factors enter The first causal fac-tor arises out of two facts. The outer rail of a curved track is ionger than the inner one, And yet the one must be covered in the same time as the other The and the corresponding axis operate as a single piece.

Consequently, the one wheel is compelled to rotate at precisely the same speed as the other. In rounding a curre, however, a greater distance is covered by the curve, however, a greater distance is covered by the some This conflict of rotational velocities between the two wheels results in slippage, and this of course means wear of metal and lose of power It is to be observed that this friction occurs irrespective of the speed of the train For the difference in length of rail between the two sides of the track remains precise the course of the state of the track remains precise the contract of the state of the track remains precise the course of the state of the track remains precise the course of the state of the cisely the same, and this controls the amount of slip-page. The seriousness of the friction is accentuated. wever, by the speed

nowers, by the speed it has been proposed so to arrange the whoels and axle that this slippage could not occur. This might be done in two ways. Both wheels might be rotatably mounted, the axle being kept "dead"; or, the one



PRICTION AT RAILWAY CURVES

wheel might be made integral with the axis, and the other rotatably mounted. That either method would be effective can scarcely be doubted, but practical rail-road people do not seem to take kindly to wheels mounted rotatably on an axis.

read people do not seem to take kindly to wheels monuted rotatably on an acts.

Whather they are justified or not, there is another riction factor which anters and whelh so first greater weight. In order to get this clearly before the mind it will be well, perhaps, to consider the action of a group of finging wheels on a railway track. Buppose take a single pair of wheels and the corresponding axis. These wheels are fanged on the inside, as in Fig. 4. Now it will readily be straided that the sale work of the sale will be suffered to the sale will be suffered to

represents such as agrangement, the wheel contacts being supposed to be at the vertices A, 2 and O. This truck would no death withstand any tendesory operating to threw it is the direction of the arrow at O. But a tendesory in the opposite direction would review the to the situation in Fig. 8. If at no other time, such a tendesory would arise at ourse in the track when the rull corresponding to 20 tended away from the truck as a whole This condition of affaire is

rapresented in Fig. ?

The lowest number of wheels which when combine in a truck are competent to maintain themselves up a track is four. The four-wheeled track is onse a track is four. The four-wheeled track is cons quantly the unit that must be dealt with in conside ing the friction arising at curves.

Now when such a truck rounds a curve, the or wheel of the forward axis is the one which first m where or use forward ages as the one which first meeter the change of direction. This is shown in Fig. 8, where the wheel at θ has begun to respond to the outrature. The wheel at θ , because the rail curves away from it, will tend to be reliaved. The impotens of the truch is in the direction S. Consequently, there is a severe grain at θ . And this condition obtains throughout the curve.

No doubt if, during the time of rounding the ou the axies of the truck could always lie in radii of the curve, as shown in Fig 9, the friction arising from the rigidity of the truck formation would be is reduced, if not antirely eliminated. Inventors ing to attack this problem must remember that the ar-rangement of the truck cannot be fiscible. The change from the rectangular form to that of the isosceles from the rectangular form to that of the isosceles trapeoid must be sufficiently instantaneous. If must not go further than requirements demand. Further, conditions must be reversible for curves bending in the opposite direction Altogether, this is a very

restly problem.

Another factor which enters is one political out by Mr. Edward Godfrey. The tread of the wheel is not borizontal, but lucified, as in Fig. 10. On the outlet wheel of the forward sate the climbing leadency resulting from the effort of the truck to move it stringful line forces the wheel famps to some such peach to as that shown in the figure. This is also do doubt, by the fact that thus greater speed is sittained for the same of the same and the same operate to the sieving of the whole acts cutward, because thus a less speed is obtained on the times of the truck. Now the result of this sieving is to thrive a very scheen portion of the outer when its is of the truck. Now the result of this sisting is to bring a very steep portion of the outer wheel in con-tact with the head of the rail. There arises, thus, a severe wedge action. This is, perhaps, the most im-portant of all the factors giving rise to friction at curves. It is due to a combination of the causes producing the other two.

th of William A. Midv.

William A Eddy, well known throughout the co try for his many kite-flying experiments, died recently try for his many site-nying experiments, case recently after an illness of several months. Mr Eddy's life was sport in the study of kits flying, to which art his contributed much that is valuable. Although a self-taught man, he did much useful work, particularly in kits photography Latterly he was very much interested in seronauties, to which his kits investigations

Dr. Carritis of Yienna, who has undertaken a study of the chemical structure of cannabriol, the active principle of hashibit or Indian Aunu, gives the fellowing graphic description of the pacular intorination which hashibit produces. "It is as if the sent illustration which hashibit produces the as often of your branching array throught that pusses through the brain, and every bodily movement is a source of yor. The hashibe state does not experience the kind of pleasure which is produced by the gratification of bodily apparities. Its feels the joy of one who hears good never, which is produced by the gratification of bodily apparities. Its feels the joy of one who hears good never the miner counting his gold, of the incutry gambler, of covery impulse and the oursets of the thought in diverted by the slightest impuration. Not one of a pacture sufficien to suggest may jrappe and these, with marriculum quicinesses and predefine. For this remains the Greenian hashibat start, before he gives kinned to the outprease of the direct in the contraction of the contraction of the contraction of the outprease of the contraction o Dr. Czerkis of Vienna, who has undertaken a study

TER STEED OF AN AUTOFILER PROFILER.
The idea of propolities a huge machine weighthe half a test at the spood of an anymen train by means of a fan assess absert on the face of it. One is apt to discount the power of a fan Art as such an intampleis, improadrable, replantations limit, that it seems to propose the contraction of the contr possible to obtain sufficient thrust against it to drive a machine of any appreciable weight. Yet this is what a firing machine propeller must do. The result is ob-tained by making the propeller of such size and driv-long it at such speed that when the machine is held stationary, the propeller will generate a current of six flowing at the rate of a hurricans. We know semsart flowing at the rate of a hurricane. We move sum-thing about the power of heavy gales, and when we consider that an aeropiane propeller is capable of pro-ducing a moderate-stand cyclone, it is easier to con-ceive of its secretage sufficient force to drive a 1,000-pound aeropiane at a fast clip. Plying machines have ttained a speed of over fifty miles per hour In orde to do this, the propellers must have been driven fast chough to have produced a current of air considerably more than this velocity, because the fluidity and elasticmore than this velocity, because the fluidity and sizeful ty of the air is emificient to cause a considerable "silp" of the propellers, which reduces their efficiency to a large artent, depending upon the design of the propeller Our front-page illustration this week shows Mr. Hubert Lathans "Antiolavit" monoplane under going a test of its propeller The propeller is revolving at the rate of about 1,100 revolutions per minute, which is about the rate of the average electric fam. but when we consider that the propeller describes circle 6¼ feet in diameter, some idea of the volum circle 6% feet in diameter, some idea of the volume of air set in motion by the machine can be conceived At a test made in England last fall, a thrust of 265 pounds was obtained Supposing the motor to de-velop only 30 horse-power instead of the 60 at which it is rated, this is equivalent to but 8.8 pounds per It is rated, this is equivalent to but 8.3 pounds per horse-power, which is about all the average program will give. A prominent American experimenter has interjo obtained 285 pounds trust with a 50-box power motor, but in this instance a large 4-box pre-pailer making int 400 R.P. M was used Both a pre-pailer making int 400 R.P. M was used Both a pre-pailer making int 400 R.P. M was used Both a pre-pailer making int 400 R.P. M was used Both a pre-pailer making int 400 R.P. M was used Both a pre-pailer making int 400 R.P. M was used Both a pro-pailer making into 400 R.P. M was used Both a pro-pailer making into 400 R.P. M was used Both a pro-ting the sound of the second of the second of the second of the total second of the second of the second of the second of the trust of the second of the sec the rapidly rotating propeller is cut at two points by wide dark bands. These are chadows cast on the blades The chadows are, of course, intermittent, as blades The shadows are, of course, intermittant, as they full upon the blades only as they come with the range of the shadows. This suggests an experiment which was eventiled to us some time ago by one of the readers of the SCRETIFF AMERICAN HE proposition appeared rather starting, but he soon the construction of the many factor of the many factor of the many factor of the starting profiled chadow, showly one the string, provided the string according to the many factor of the string, provided the string according to the many factor of the string, provided the string according to the many factor of the string provided the string according to the string provided the string to eng ang waities around so that it formed a hazy patch of reflected light estimilar to that produced by the propeller hisdes in our front page illustration. The persistence of vision of course accounts for the haze in the first place and for the shadow as well, because both are intermittent, as an instantaneous photograph

The Fublic Bath System of New York City.

In a paper presented before Section 1 of the American Association for the Advancement of Selence, at the Boston meeting, Documber Sith, 1909, suttled "The Public Bath System of New York City," by William H. Hale, Ph.D. Shperinendent of Public Baths of Procklyn bowayed of New York City, some interesting facts were stated showing the increases and utility of this recent point institution for the promotion of the

error to the consolidation of the surrounding cities into Greater New York there was no interior public bath. All were located along the error front as float-ing baths. The first interior nobile bath in the second bath. All were located along the river from as non-ing baths. The first interior public bath in Manhattan borough was established on Rivington Street on the east side of the city March 23rd, 1901, and has been the most crowded of any bath, on the average, for the

NAM.
Newer baths opened on Pilkin and Montrose Avenues, Brooklyn bortuch, have hed more interest to make the many others. It is attact that on one hot estimated day 3,000 bathers used them. A third public of the state of the s

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the of seed side I send, see a served, side as solutions
(daines in I seed for use of a tab hall., The five
profile are madely of the shortly title, authorizing so com-

later bath houses swimming pools have been built sixty fact long by thirty-sine feet wide, said to be the largest in the city. Never buth houses have a symmasium built in the second story above the bath house proper. This has been found to be a most use ful adjunct. Mr Hale suggested still further that roof gardens be built above the gymnasium. He also recommended that there should be a greater extension of facilities for public bathing, particularly the establishment of a great public bath by the sea modeled after the baths at Revers Beach and Manhaset Bunch in chusetts. At Coney Island on city property st public bath structures could be constructed as would be remunerative to the city and yet would supply a pre-ing public want. Mr Hale further recommends the tablishment of a separate bureau of public baths and tablishment of a separate bureau or puone caton and gymnasiums, with uniform pay to attendants and offi-cers, to cover the whole city The city should have full control of the proposed seaside baths, as they are cers, to cover the whole city. The city should have full control of the proposed seaside baths, as they are intended for the entire city and not wholly for the borough in which they are located.

RELATIVE POSITIONS OF MALLET'S COMET, THE BARTE, AND THE SUN

At the top of the accompanying drawing the cor At the top of the accompanying drawing the comet is shown in its position for January 1st, 1910, outside of the orbit of Mars. At the left the earth is moving in its orbit away from the comet, the distance between tham being about 115 million miles

tham being about 116 million miles
On March 24th the earth will reach the position
shown in the drawing, while the comet will have
moved to a point on the opposite side of the sun During this period (January ist to March 24th) the comet will be visible, with the telescope, in the western evening sky, but on March 24th, when passing back



RELATIVE POSITIONS OF HALLEY'S COMET, THE RARTH AND THE SUR.

of the sun, will be invisible for several days. The distance between the earth and comet at this time will be 165,000,000 miles.

When the comet next emerges from the rays of the sun it will have shifted to the morning sky, rising san it will have shifted to the morning spy, rising before dawn, and for the first time becoming an intor-cating object to the naked-up observer. The earth and comet will now rapidly approach each other and the latter will greatly increase in brilliancy.

About April 20th it will pass its nearest point to the sun, as shown in the drawing, and on May 18th with sup, as soown in the crawing, and on any four win again disappear in the sun's rays—this time, however, passing in the front of the great luminary it is pre-dicted that the nucleus will cross the sun's disk about five minutes of a degree from its center, thus furnish ing an opportunity to observe whether the nucleus is

ong an opportunity to observe whether too intrins in opaque to the sun's rays. The transit will not be visible in the United States as it will occur after sunset here On the night of May 18th the sarth and comet will un the night or May 18th the sarth and comet will rush past each other and the earth will probably sweep through the tail of the comet. They will be only 12, 000,000 miles apart. After May 18th the comet will strain its maximum of splendor in the swening sky, and in a few days thereafter its glory will rapidly fade.

The Current Supple

The Cerront Supplement.

Dr Aired Gredevits opens the cerrent Surrazurr, No 1778, with an article on a more plow on ployed on a Seriar sulvar. Some interesting information on unbmarine some signals is presented Mr Werne D. Rogers writes exhaustriety on freeward of manufactures in make the impliced on a chespical manufactures is make the impliced on a formation of the complex of

navigation is the provision of sultable places of refuge for the enormous dirigible belloons of which Germany is the proud possessor. The problem is discussed in a coplously illustrated article by our German aeroa copiously illustrated article by our terman aero-nautio correspondent. Dr. Robert Amory writes on coffee as a beverage and describes a new method of preparing it for the table. The great guano deposits of Peru are described and illustrated. Ur. L. H. Back-land summarises the electrical and electrochemical applications of bakelite

Correspondence.

THE RED OF THE "DANIEL TREET"

To the Editor of the Scipatific AMERICAN in looking over some old files of the Scirrippo 1897, reference of the building of the old merchan ship "Daniel I Tenney," built at Newburyport, Mass by John J Courier Jr

This item, in connection with the storm now This item, in connection with the storm see reading, carried me back to eleven years ago today, when the "Daniel I Tenney" was lost off the coast of Scituate, in the distantors November pair. The wrockage was strewn for miles along the aboves of Scituate and Marabheld A portion of the stern containing the name was thrown ashore opposite the writer's boust priced up to meet of the thirty of mish of the cabin, pieced up none of the thirty-finish of the cabin, d have made several pieces of furniture of it, hich are prized quite highly by the owners. This is the sad ending of the career of that noble ship which so proudly braved the storms of old ocean so MARK VORTE

Perhaps some of your readers may be interested to know where the "Daniel 1 Tenney" laid her bones to

Res View Mass

THE INVENTOR OF THE STRAMBOAT

To the Editor of the ECHTPIN AMPRICAN
I beg to thank you for publishing my letter, as also
for your courtesy in sending me the copies of your

I wish to point out that although I insist that it would be a most difficult matter to prove that any other of the so-called inventors have any just claim to priority, yet if any reliable proof of any "invost having produced a practically successful steams "inventor' having produced a practicatify successful atomatods prior to 174 its available, then I would once for all sink any taim on behalf of Jonathan Hulls, but in my humble opinion, from research I have made upon he subject, such its not possible. Therefore I boildy search that he and he alone should have the great observation of the production of the product

tor a memory, it should not be for the purpose of re-quiring commercial success He laid the foundation for commercial success this fast is undensable, therefore why should be not have the honors and dis-tinction for his genius? Always remembering that he

eas many years ahead of his competitors

I do not admit, what is so generally claimed, that it is not the man who invents, as the man who puts It is not the man who invents, as the man who puts into actual practice, that is descriping of the honors. Without the man who invents, there could not be any need. Neither would be have any place for putting into practice that which he would otherwise have had no knowledge of, had it not been for the earlier inventors

ers clear that Jonathan Huils, although the side-paddle boat had existed for many years propelled by both manual and animal labor, yet he was absoboth meaning and agent atom power to supers, but in the strength of the streng And with his with the side paddles, his cistm to originality is made with the made pagness, his craim to originality is made doubly sure, always remembering the very early date of his invention and the very crude form of steam engine which then existed. Therefore the greater the r that should be accorded to him

With regard to Fulton, no serious cisim can stand in face of the foregoing. To put it mildly he was only a copylet in the matter of steam propulsion cannot too foreibly assert that Robert Fulton has no cannot too forein); seaser that Know-r whom has an claim whatever, and this fact Know-r whom has a reported. This gentleman asserts that "England should certainly set up a monument for Jonathan Hulls, as he was undoubledly the original inventor in England", and he further states "whether he actually built the boat or not is of no special conse-cutability built the boat or not is of no special consequence

have been able to provide proof that he did build his boat, and that it was a practical success quently, any additional proofs I have supporting him -- and they are numerous -- would be quite superfluous. onld not possibly be more than one inven tor of steam navigation, whatever adjectives be us J. Hooves HULLS

Manor Park, Essex, England

GLASS ESPALIER WALLS.

BY JACQUES BOYER

In the cottivation of fruits on the espalier system the trees and vines are planted along a wall of stood brick to with all their branches are arready attached so as to spread them out into a plane sur for an a side of write ace so flight and air to every part Ordinarily the dire tion of the sail is desired including the control of the sail is desired and the varieties of pears herries I aches apricots apples and other f uits whi h are planted along the wall are selected

with refer nce to his di centing if the wall was built in an east and west direction so as to expose one face to the south the one face to the south the other face was almost? tirely wasted. In order to remedy this state of af fairs several fr it grow ors have conceived the idea of employing trans-parent espalier walls through which the light of the sun can penetrate to the trees planted on the north side of the wall Comte Horace de Choiseni in particular has conduct esting experiments of this sort on his estate at Viry Chatilion in the Depart Chatilion in the Depart ment of Scincet Oise and has obtained some very promising resuits He built a glass wall 6½ feet high and about 60 feet long extending in an east and west dire tion and

and west direction and planted fitters pear trees of the variety planted fitters pear trees of the variety planted fitters pear trees of the variety planted fitters of the pear to the pe

age weight or about 11 clinoses
Another experiment with glass cepalier wails has
been made by MM Croux & Sons in their nursery at
Val d'Aulony in the Department of the Seine The
wall which they constructed also lies east and west and consequently presents northern and southern ex

posures As the ac om par yir g photographs show par yii g photographs show the wall is surmounted by a glazed roof projecting on each side Along ea h fa e of the wall were planted Calville apples Wi Doyen Passe-Crass Winter and Directrer Aiphand pears together with pea h s and grape vines being taken to place trees the same varieties on ea h con parison easy a d a u

In 1907 these trees and vines produ ed their first crop in which no differ en e bets en the fruit prodused from the north and so th sides of the wall o id be de e ted. The same result as shown by ame result as shown by ro s of 1908 and 1909 There is indeed little

diff ronce in temperature between the north and between the north and south fa se as he former is heated by the solar rays with h traverse the g ass and its latter is cooler than the so th side of a masonry wall for the very reason that some of the incident solar radi through the glass and consequently less is reflected and absorbed. This difference in absorbing power how the class wall inferior to the masonry wall and absorbed This dimension is absorbing power how were makes the glass wall inferior to the mascarry wall in the matter of warming the plants and protecting them from frost at night. A masonry wall absorbe a great deal of heat during the day and gives it out at night but this effect is comparatively small in the case of a wall of gines

In the matter of cost there is little difference be-



A GLASS ESPALIER WALL GOVERN STREET

twen the glass as d the masonry walls. The cathedral glass o phoyed by MM Groux costs about \$8 or \$7 per linear yard of wall \$ feet high including the cost of the glassed roof projecting over both sides. A masonry wall of the same height would cost \$6 or \$6 per and the addition of the glassed roof which of course in the country in this case would ruise the total cost to \$6 or \$7 per linear yard More extensive and (eng continued experiments most be made however. before it will be possible to pronounce a positive ofin ion concerning the relative merits of glass and ma

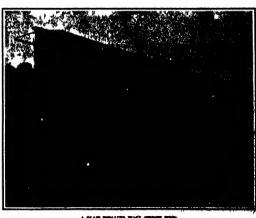
There is now a drospect of a thorough, explicit can sus of the population of China To grasp what this gignifies one must first remember that China is vastly the most populous state of the whole world and s ty that hitherto such estimates of the number

inhabitants so have been published here finatused between 100 000 000 and 500 000 only Commonly at the present day the number of natives in Other is nectioned as 600 to 600 million, but expert suggraphers bread this number as greatly influed. In many late hooks is consequence the reader finds only 500 to 500 or indeed only 500 millions stated as the prohibitors had accessed the population. Nevertarily it occurs is the thinker that the importance of all appositions in the contract of the prohibitors and the prohibitors and the prohibitors are said to the prohibitors.

and its directions must de-pend very largely on a sure calculation of the size of the population of China Of course in the course proximate number of the illes and were therefore quite unreliable And the shadowy value of such consume was not improved

can district a residual to the control to the immense action to the immense action of the purpose of military committee or a tax promption or of collection or a tax promption or a control to the immense action of a consum of individuals. The former is to be ready by the early part of 1910 the latter by 1911. In view of the immense action of the Chinades Rappires the vant ness of this task can hareful be overleathed. The former is to be ready to the immense action of the Chinades Rappire the vant ness of this task can hareful be overleathed. The former is to be ready by the early part of 1910 the latter by 1911. In view of the immense action of this task can hareful be overleathed the terminal parts of the Rappire though the that cannot be ignored that certain parts of the Rappire deem themselves wholly independent and will therefore resist the necessary official vistation required by the constant is much districts or will try through the stiffest members in much districts or will try through the stiffest members in the form of the constant of t

crete poles h al in shape and hollow through the center are used by the Okiahoma Gas



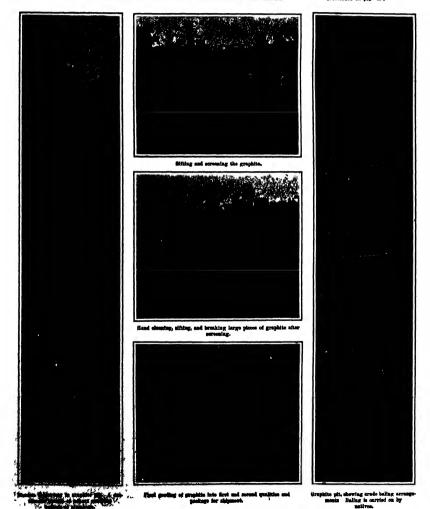
A SLASS ROUGHLESS WASCASSESSED STORY

GRAPHITE MINING IN CEYLON

BY THE ENGLISH CORRESPONDENT OF THE SCIENTIFIC AMERICAN.

Among the various interests found in the island of Copion, that which is the most abundant is graphic or planskap, practically the only one found in suit clear quantity to render exploitation profession. In asstationed a worldwide reputation for the scenitism (unity its composition being practically pure carbon and is actically demand for creations. The sweet carbon and is actically demand for creations. The sweet carbon man is a specially demand for creations. The sweet part of the province of the composition being greater part of which is approximately 50 600 cms per annum the greater part of which is approximately for the province of the composition of the compositio

the trade has undergone considerable expansion with the result that mining is being extensively developed. The mineral is found a well-and noisis in the control was convering frequently in a flacous or days form the datase being disposed at right angles to the wall of the well of the well or the result of the well of the well or the seven wary in with sometimes being issue than as eighth of an inch while no others they will extend to several feet. Some are found to follow the foliation planes of the various returned to follow the foliation planes of the various returned to follow the foliation planes of the various returned to foliow the foliation planes of the various returned to foliow the foliation planes of the various returned to foliow the foliation planes of the various returned as existent to a series of being but the min of existing the control of the various returned to foliow the foliation planes of the various returned to foliow the foliation planes of the various returned to foliow the foliation planes of the various returned to foliow the foliation planes of the various returned to foliow the foliation planes of the various returned to the minimal existing the planes of the various returned to the minimal existence that the minimal existence the returned to the various returned to the variou



" BRANCHE MUTIES IN CETAS.



RUFUS PORTER AND HIS "FLYING SHIP."



BY C. E. McCLUER.

Soon after the Montgoiffers invented their first "hot air" balloon, which was almost immediately followed by the first 'gas balloon, the attention of scientists and inventors seems to have been centered on the and inventors seems to have been centered on the spherical and slongsted gas bag as a means of flota-tion, and the provision of propellers and rudders to cable the narigator to control the movements of the unwieldy end wind-teged sphere, and produce what is now known and briefly described as a "dirigible" balloon (Dutting ail reference to the work of the many accomplished and venturesome balloonists who originated or copied the various devices which they adopted for the guidance and management of their spherical or pear-shaped, or elongated and cigar-shaped gas envelopes, we will revert at once to the

subject of our sketch
Rutus Porter, belonging to that numerous class of
ingenious New Kinglanders usually styled "Yankee inventors' was born at West Boxford, Mass., May 1st,
1782 and died in New Haven, Conn, August 13th,
1884 Although he received only a common district

varying success, his journalistic enterprise was per-chased by the present proprietors of the SCHRYLING AMERICAN

iong Porter's less noticed inventions, and the one Among Porter's issue noticed inventions, and the one from which I presume he reaped the smallest recompense, was a figing machine, or as now styled, a "dirigible" balloon, but which he dubbed an "aereport." As nearly as I can ascertain from the records at my command, this invention was made and pat-ented in 1830, but not until 1852 did Porter seem to make any serious effort to exploit the device. In that year he organised what he called "The Aerial Naviga-tion Company," and attempted to raise the funds neces-sary to enable him to construct his first seroport by may to enable him to construct his first aeroport by an appeal to popular support through the sale of \$5 bonds or certificates.

bonds or certificates.

Among the papers of my deceased father I have recently found one of these bonds, issued to him under
date of April 28th, 1852, a facaimite of which is reprinted berewith

Below follows an abbreviated copy of the "proposi

not exceed \$25 per day it is necertained by a misself and careful estimate that an acroport 150 feet long and capable of carrying the persons at a speed of sixty miles per hour, may be constructed for \$1.500. Now, having been disappointed of the finder registate to put this invention in operation on a seale of pre-tail utility; I propose that if three bundred persons that utility; I propose that if three bundred persons whole amount of 1,500 dollars shall have been subserted. I will northwith construct this pioneer serve-treat. I will northwith construct this pioneer servewhole amount of 1,600 dollars shall have been sub-erribed, I will forthwith construct the pioneer sero-port, (which may be done in air weaks), and when this is put in operation I can readily command the requisite funds for constructing a large seroport as above men-tioned. And I will searcrass that each subscriber on the payment of the said sum of five dollars, shall be fur-nished with a requier title deed, which shall estitle the belief thereof to one three-hundredth part of this the source increas to one three-nangreous part of this first aeroport, and also to one three-thousandth part of the first large seroport that shall be constructed, and of all benefits and emoluments that may be de-rived therefrom for twenty years, the said seroport



PAGRICULE OF THE ARRIAL MANIGATION COMPANY BOWD WHICH SHOWS THE PARTY AVERDARY DISIOTELS CAN

school education, he possessed an aiert mind and a neientive memory, which, coupled with a natural genius for observation and invention, fitted him ad nirably for an active and useful life. He early dissed an alert mind and a played inventive abilities of no mean order, as is at tested by the list of his patented inventions disclosed ords of the Patent Office Some of his patents displayed an acumen and foresight which ied him into the van of progress, and proved that he was fully abreast if not actually shead of his time. Among his numerous patented inventions we find enumerated a cord making machine a steam carriage or ordinary road robics, prophetic of the latter day automobile, a ploneer treadmill horse power machine, a corn sheller, the inevitable Yankee churn, a washing machine, a signal telegraph, and a municipal fire-tarm system, the latter doubtless being the forerunner of the largely adopted and efficient Gamewell fire-slarm

system, now so largely in vogue.
in 1840 we find Porter as editor of The New York Mechanic, the first purely scientific newspaper pub-lighed in the United States. The next year it was re-sloved to Boston and the title changed to The Ameri-Mechanic in 1845, evidently not having made a nunced success with the publication of The American Mechanic be returned to New York and began the publication of sucther journal which he styled "Scientilic American, the Advocate of industry and Unter-prise, and Journal of Mechanical and Other Improvements, on a cash capital of \$100. The first number of the new periodical was issued on the 28th day of August, 1845. After six months of struggle, with tion and prospectus" alluded to in the bond, as I find it printed in the issue of the National Intelligencer of March 19th, 1852 "THE PLYING BRID"

"A chance to secure a cash income of \$10 to \$30 per week for twenty years by the investment of five dollars in advance

"It is extensively known that the undersigned has by theory and practical experiments so fully demon-strated the practicability of serial navigation that all who have fully axamined the subject are convinced, and no person, even of those whose interests and the person. And no person, even of these whose interests are deverse to its success. Can offer a word of rational accument against it. Several model mashines have been constructed, and each of them has operated as made and one of them, datters het long-cried a small stoam segins, by the power of which the manchine was proposited, and, being guided by the machine was proposited, and, being guided by the machine was present or wind, in direct times or circles, according to the adjustment of its helm. This machine was very an examinated and adjusted by hundridge in law? For windleston and notions thereof were published in several Boston and notions thereof were published in several form those several contracts. who have fully examined the subject are convinced, Boston and notions thereof were published in several newspapers of these cities at the time. Since those experiments were made the inventor has made additional improvements whereby the invention is not perfected. And it appears certain that a sate and curried serial sails (or surroport), capable of carrying one hundred and fifty passwapers at a speed of intely miles an hope, with more parter sailey than either incanteau or railread carr, may be oncertered and fifty in the sail of t to be kept in repair without expense to the share-holders. . Washington, March 18th, 1852. Rufus

holders. Washington, March 16th, 1852. Rutus Forter."
While with the solids knowledge and experience of a hilf century we can see wherein Forter was mistaken in his calculations and visionary to a constitution of the control of the present day, had be but been in possession of the present day, had be but been in possession of the general control of the control of

Scientific American



INITATION MARRIE

A simple method of imitating marble with all its beautiful vein markings spots, and irregular lines and variable colors, is as follows

ne skill in giving the veining, etc, to the produ will be quickly attained by making a fow small stake in a plain way previous to undertaking the production of a larger number The colors for the veining must all be of a mineral character, as follows plumbago (black lead), chrome green (dark), common crocus,



INITATION WARRIE

yellow other, red oxide of iron, and ultram wa few please of stout sheet glass, say 7 luches by 11 inches (an ordinary 11x14 photographic noga-tive cleaned and cut in halves is just the thing) tive cleaned and cut in harves is just the thing)
Make a wooden frame of ½ inch board, an inch dep
with a division in the middle, simply held together
with i inch iron brads not driven firmly in Leav
an eighth of an inch projecting so that they can be easily withdrawn with a pair of pilers. Arrange these strips of wood, after being smoothly planed all over, so as to give two squares of five inches internal

Make up the following in a bottle Paramu wax, 1/2 Make up the following in a bottle Parafin wax, in ourse, beginn, it plint Pince this, well ereds of a warm room to dissolve, ald this by shaking it out a standard when the parafin is dissolved it is ready for use. Brush some of this preparation all over the incide of the wooden panel Then take a plove of Caston fannel or soft rag, well it with the bentite manner of the property o glass plate, polish it thoroughly with two pieces of acft rag until there appears to be nothing left and sort rag until there appears to do nothing lett and place the frame npon the glass plate Now lay a mirror, or a piece of plain slivered glass npon the work bench, or table, and place a hlock of wood at each end so that the glass plate and frame will rest each end so that the gissa plate and frame will rear about four linches above the mirror the frame be-ing held in place by a couple of rubber bands. Place a teaspoonful of chrome green in a small sauver and a teaspoonful of black load in another sauver and add a dessertspoonful of water to each

Mix the following in any suitable vessei (a small stoneware pitcher being well suited) To ten onneces of water add anfilcient plaster of Paris to make a mixture of the consistency of thick cream Skim off

the air hubbles and any dust that may float on top, when in the course of a minnte or two the plan course of a minute or two the place or must be poured carefully into one side of the square on top of the glass plate. Fill this nearly half way. Pour the remaining portion into the other square. Now dip a small brush into the mois-tened black lead, press it through tened black lead, press it through the soft plater and paint the plain or signess veining or spots. The platers blends beautifully with the color and the mirror enables one to see the affects produced. Any line made too strong or lumpy in appearance can easily be rectified by a light stroke or the brush

by a ngat groups of the orman Green streaks or veins may be A EFOHEZ-LI painted with the same brush after washing it quickly and dipping it into the chrome green. Treat the other square in the

same way. Raving now produced the velating, the block may be refindred as follows; Have ready to hand a few pieces of gardenided two needing. Out a piece of the piece of the

small quantity at a time, pour the mixture upon the plaster and wire netting until the panel is filled. Treat the second square in the same way, allow the whole to stand for an hour, until both plaster and cement have become quite set. As soon as all has becement have become quite set. As soon as all has become well set, fraw out the brads with a pair of pilers
and remove the woodwork carefully This will
hasten the drying Take care not to shift the cast
hlocks upon the glass plate Let them become quite
dry while in contact. When dry the colors will not
have more than eachited as brillings and have more dry while in contact. When dry the colors will not be more than one-third as brilliant as when wet, the effect beling precisely like markle. The face of these blocks will possess ever smooth surraces with only a partial gloss upon them, beling at the same time porous. The porceity can be stopped and the gloss much improved by the use of amylacetate colloiding. This is improved by the use of amylacedate collodion. This is practically a solution of gun cotton in amylacedate which not only fills the pores of the plaster, but forms a coaling as clear and transparent se water. It resists the action of weak acids and alkalics and can be washed with water and a chamis leather at any time without injury to the object it covers. When the access expression of the control of the control of the covers when the course we want to be controlled to the covers.

When the squares are perfectly dry and slightly warm they must be placed in a plate or large saucer, containing a mixture of amplacetate collection and one third amylacetate This thin collodion will penetrate the pores of the plaster for a quarter of an inch or the porce of the plaster for a quarter of an into to more in a short time. Remove the square and stand on one corner to dry in a warm place. When dry a couling of the thick amyfacelse rolledion may be brushed upon the surface and allowed to drain from the opposite coiner. The arriace will improve in brightness with every coating. Amyfacelate colledion costs about two dollars per gailing at any wholesale chemists. A stailon will go a long way in waterproofing such also for inflation markins as here dewribed

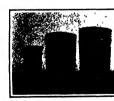
A much harder material with a slight grain can be A much harder material with a slight grain can be produced by niking a small quantity of ground pum ice or ground glass with the plaster which must be infimately mixed to insure uniformity. This mixture is sometimes termed Parian count in mitation markle blocks can be made by the above process into any shape such as a keystona for a mantelpiece or circular shape such as a Reystuna for a mantelpiere or circums with an inhald border and in many other ways that will suit the taste of the individual worker. In place of Porlland cement, Parlan coment may be used as deor Portions cement, Parisis content hay be used as de-wribed above, thus producing a sish of an almost uni-form color. Any sixe of sish may be made as described Of course the thickness must increase with the size of the sigh to give strength

SOME CURIOUS CHEMICAL GROWTHS

BY ALFRED P MORGAN

The following experiments are somewhat out of the ordinary but may be performed with the materials at hand in any chemical laboratory, or obtainable at a well-stocked drug store

well-stocked drug store
in the first experiment mercury is prepared by
throwing into it small plexes of clean metallic sodium
the sodium will aiment immediately take fire and
have a hard crust on the surface of the use rury
Freick thic rerust with a glasser out and sid it in the
mercury until it dissolvers. The little gill bottle on
the right in the lituarisation contains also which event meters of mercury having sodium dissolved in it. The tumbler on the left shows live cubic centimaters trans formed into 'ammonium amaigam,' and occupying a space over fifty limes the original volume of the mer-The transformation was brought about by



PLANT-LIKE GROWTHS DUE TO CAMOTIC

throwing the mercury into a tumbier containing a throwing the moreury into a tunnier containing a strong solution of sai ammondate in water. The mercury immediately swells up into a spongy mass. The time clapsing between the moment when the sodium analgam was thrown into ammondum chloride and the taking of the photograph fituatrated here was about thirty seconds.

The reaction may be represented as appeared dissolved in Hg) and NH₂Cl = (NH₂ dissolved in Hg)

ation of the mam, it is seen to be very

spongy in nature, and its growth in all probability caused by the evolution of a gas. This is indeed the true explanation of the phenomenon. The NH, of ammonium chloride dissolves in the mercury but se menon The NH, of the the mass decomposes, and bubbles of ammonia and bydrogen gas cause the enlargement.

In a few moments the mass will begin to sink, and a strong smell of ammonia will be noticeable. If a lighted match is held over the amail bubbles arising from the liquid, they will burn, lighting with the "pos lndicative of hydrogen The mercury will soon r turn to its normal nal condition, in acco

2 Nil, dissolved in $Hg = 2 NH_s + II_s + IIg$ There can be no doubt that the NH, is actually pres-There ian be no doubt that the NII, is actually present in solution in the mercury, for when a sail of an monium is docomposed by observoyers, he NII, ion monium is docomposed by observoyers, he NII, ion on SII, is formed. But if a post of mercury is used as the negative electrode the NII, dissolves in the mirrory and forms an aeatigan with II illowiver, during the formation it swells up and gives off the products musticende above



GROWTH OF ALUMINIUM OXIDE ON A TRIRPHONE

The most interesting point about this experiment is that it is in accordance with the theory that ammon lum would have the properties of a metal if it could be isolated for excepting this substance the metals themselves can only be dissolved in mercury

The second photograph is an illustration of an ex-periment depending upon the peculiar property of aluminium amaken

The action of sulphurk and nitric acids upon ordinary aluminium is very slow because the metal re-ceives a coating of aluminium hydroxide and is shielded from the acid, but if the aluminium is amai gamated with mercury, the action is very rapid

Aluminium has a very great affinity for exygen, and will display all the metals save magnestum from their oxides if a mixture of aluminium powder and ferric oxide is placed in a crucible, and fired by means of a place of imming magnesium, a violent reaction takes place enough heat being produced to leave the iron, which is one of the products in a highly motion state. This is the principle of the "thermite" used for weld Ing, etc

F: O. | 2 Al = Al.O. + 2 Fe

Some idea of the speed of reaction and the heat gen-rated may be gained if three small iron crucibles are erated may be gained it torce small from crucibles are placed in a villent column, one above the other and separated five or six in hes. A mixture of aluminium and ferric oxide is placed in the top crucible and in-lified. Almost immediately moiten from will melt its way through the bottom of the first crucible and pass way through the notion of the first crucine and pass through the second and third as if there was nothing in the way. A box of saud should be placed beneath the bottom crucible to catch the motion metal.

The affinity of ainminium for oxygen can be shown

by smalgamating a piece of the motal with mercury. The surface is simost immediately oxidized and the result is a growth of white tufts of simminism unide over the surface of the metal where it has been amaignmented. The growth will rise about one eighth of an inch or more in five minutes.

The easiest method of analga-mating the aluminium is to dean a small portion, and then drop upon ne men urk nitrate soluti and allow it to dry The growth will immediately consumue

to the illustration, the case of an aluminium backed telephone receiv or has been used for the experiment, and the resulting growth is shown by the white spots, principally on top at the left

The third photograph is a striking illustration of osmotic pressure. The tall plant like growths may be formed by throwing small pleces of any of the fol ing crystalline chemicals ferric nitrate copper thior ing crystalline chemicals form altrate copper infor de cobair intrate, nickel sulphate and manganess sulphate into a beaker gines containing a diluted soin tion of sodium silicate of 11 specific gravity. The crystals will almost immediately sprout up his vari ous fantastic shapes, and grow several in hes in the e of a few minutes.

The celts dissolve in the water of the sodium alli



A SPONSE-LIKE TRANSFORMATION

cate solution and react with the sodium silicate to form a silicate of the metal of the salt added. For instance in the case of copper chlorids copper silicate

is formed

(uCl, + Na,BlO, = CuBlO, + 2 NaCl

Bilicate of copper is insoluble and so the result of

the reaction is a small portion of liquid around the

trystal of CuCl, surrounded by a sack of insoluble

CuBlO where the copper chloride has come into con tact with the sodium ellicate

Particles of a dissolved sul stance exercise a pr similar to that of a gas explained in physics texts under the title of the kinetic molecular hypothesis

n the sa k is first formed the pressure is equal on both sides but as more of the copper chloride dis-solves the pressure on the laside of the sack becomes so great that it hursts at the ten where the hydrostatic

so great that it hursts at the top where the hydroetstic pressure of the liquid is least and the sack weakest. The liquid spurting out of the top is immediately surrounded by a new sack and the process continues until the sait is exhausted or the growth reaches the

urface of the liquid

The silicator of the metals of the saits mentioned in the fist above ere also insoluble and the same expla-tion holds true for their action

WIRELESS REPERIMENSA WITH A SPACE

EACHIE NY N NY N NY 1 AND N AN. In the large quentity of literature on wireless telegraphy practically the only method described of pro-ducing the high tension corrects required is that of ouring the algorithms of the color ending the first of using a powerful inflation coil or e high tension transformer on an alternating current. The possibility of utilizing the discharge from a direct generator of static electricity is barely touched upon. In order to t at the practicability of the use of such a source of t at the practicability of the use of such a source of current the writer constructed a static machine of the Wimsharet pattern and made some experiments with it. The machine a photograp to which is shown herewith was fitted with two glass plates levels; inches in diameter supported on a half line his inches in diameter supported on a half line his shart. Each plate had thirty sectors of heavy tinfoil 3½ inches long. The brass work was made from 316th round rod and the brass belis

on the collectors and Leyden jars were pur-chased from a manufacturer of brass bed steads as were the large balls terminating seeds as were too large balls terminating the discharge rods and the sending device below. These balls were filled with crushed tinfoli and contact made by inserting the supporting rods in wooden hushings fitted in the necks of the balls.

in the necks of the balls

The two Leyden jars showing at the front of the
machine were made from hydrometer glasses provided
with feet and each had a combined inner and outer
coating of 65 square inches of fell The interior out coaling of 65 square incluse of foil. The interior coal ings were erranged to be connoted with the discharge rods hy short loops of brass chain and the exteriors joined with a similar chain isld elong the base of the joined with a similar chain isld elong the base of the machine. The device shows attached to the front support is the key by which the spart is thrown into the serial and ground and the messages sent. By pressing the lower lever the recking arm above it with a supports the two insulated balls is pulled up-ward, and the latter are thrown into range of the spart more the clus large balls. One of the key balls ground such as a gas or water pipe. I found it best ground such as a gas or water pipe I found it best to allow the acrial ball to take its charge from the positive discharger. By pressing the key for longer or shoit I intivals the dols and dashes of the code are easily obtainable

are easily chialanable. An arrial was rived on my roof at a height of 65 feet above the grund consisting of two horizontal coper wir a supported on twe-foot apreaders with lada (ff nar the cuter running to the edge of the foot where thy acro Joined and a single who led the ne to the nachate on the third foor. This serial gave a wave Penth of about 12 meres. O'ling to the extr nuty high tension and wanescent nature of the dicherge it was ne searcy to insulate the wires with x at care which was done by any porting them in par and 1, Jakes those. The machine as constructed gave

a solid stream of bright twoin h sparks re sembling those from an lidue tion oil when from
tion oil
the large its
balls the jars uncon nected With the letter in cir cult in the neus manner a very powerini spark of about the

was obtained at intervals. With a large bell on the right hand rod and a small one on the left, a much thinner and more frequent spark from five to skx inches long appeared. The first experiments in sending messages were con-

ducted with the receiver in a room about thirty feet away from the machine, using a gasoine ground and

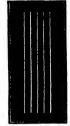


Fig 1 -- CRATING WHICH GIVES THE COLOR

no receiving aerial. A number of detectors were con structed experimentally in leding a coherer and de-coherer with a X junch gap filled with nicled silver filings a microphone consisting of a piece of hard pentil lead bridgap two steel needles a bare point electrolytic and a Marconi magnetic detecter. In all tho tests made the coherer gare the best results at short range and the microphone the best for longer distance: Indeed the sounds were much cleaver in this case then when the electrolytic was used the title latter is considered the most sensitive of all



Fig 8 -DIAGRAM EXPLAINING THE COLOR ILLUSION

in these experiments a home made relay of 200 ohms resistance was used with the coherer and a pair of 75-ohm ear phones with the nicrophone In the experiment conducted in the near hy room the straight experiment conducted in the near hy room the straight expert from the discharpe bills was used and specific are discharge shall was used and specific are discharged to the control of the control being to a water pipe. The signals were nection being to a water pipe The signals were the control three hundred yards no result was obtained with either reveiver although the serial was extended to a length of the control of the c of thirty foot

r to increase the power of the spark the inner coatings of the jars were connected to the d chargers the outer coatings still remaining unc

By this arrangement a shorter thicker a By this arrangement a abortor thicker and more first interest to the key balls which while not as frequent as in the former case was sufficiently continuous to easily permit sending distinct data and dashes when the machine was driven at a slightly higher speed. The mitrophone now responded clearly when the key was worked aboving the in crease in self-citing of the new arrangement and a more than the continuous properties of the continuous productions appropriate the continuous productions are produced in the continuous co receiving station including increpance temporary celver inning coil batteries, sic was transferred to a house three-quarters of a mile away and a receiving aerial erected As the owner of the house objected to the use of the roof for this purpose I was compelled

is par up a pichès instituité sorgia et s'estical typa, protectus sivas le high-éstays reals étander protectus sivas le high-éstays reals étander protectus sivas le resultant sivas de la company de

of Leyden jars and so send greatly increased into the serial and increase the radius of ed new use serial and increase the radius of efficiency. The details of the spark gap showing the character of the spark as given from the interiors of the jars alone as used in the foregoing experiments are shown in one of the photographs. The receiving apparatus with the susception of the tuning coil is also shown

A COLOR AND RELIEF HATELS

Hold a pin vertically with its pointed and between the thomb and forefinger Place the pin thus held before your oye in contact with your cyclid Close the other eye and took at the drawing Fig 1 that being at a distance of about three to five inches from

brownish lines are seen to move on with the paper but the hinish bars run in the op-

the paper but the hisiah bars run in the opposite direction
The near-by brownish bars are the black
stripes of the figure In spite of the fact
that the distance between the figure and
the stripe are not much historied as the pin
decreases the aperture of the pupil and thereby increases

Treates the aperture of the pays.

The far away highs bars are the shadows cast by the pin on the retina in the middle of avery imminous the pin on the retina in the middle of avery imminous the pin on the retina in the middle of avery imminous the pin of the pin on the retina in the pin of the p the pin on the retina in the minds of avery lummous bean, sent by the corresponding white line. The shade is cast right side up but the retina inverts it and the result is the curious inverse motion of the binish bars when the paper or pin is made to travel

interally interactly

The origin of the bluish color of these bars is shown on Fig 2 L L is the cross section of a white line The pin P (relative size is exaggerated) closes the central part of the crystalline lens and as the the central part of the crystalline less and as the achromatism of the periphyry is imperfect there is a rather strong disperation of the white light. The bits error at 100 metric light of the collection of the entry a B of the shaded spectrum invade the obscure central zone which is the shadow of the plut This errorangible colour red and yellow lag behind and re-main on the image of the black stripes right and fort of the white lime. The admittance of colored light to the dark stripes in increased by the fact that the whole image being out of frome the limit between the black and white lines cannot be sharp: The bits rays need to hence the first the red and

The blue rays meet to a more source the veg and yellow rays they give therefore the impression of coming from a far-qway luminous object. The con trary statement is true for the red and yellow rays. This accounts in part for the fact that the brewards bars seem to be nearer than the bittak lines. The

writer con that this net interely est





REGERVING APPARATUS, SECURITO THE PROTOGRAPH SECURITOR OF MICHAEL SECURITIES.

WHEN PARAMETER INVESTIGATIONS.

ASSYMANY TREATMOND PRANCHISTERS,

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Of General Enterest.

RIMBALMING INTERLIMENT T F.

RILLY, Troy, N Y The improvement is the structure of the process of embanding, and the purpose is to provide a device adapted to conform to the curves of the devicalitan

whereby it is possible to retain points even the retain of the retain of

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the article to be livened. When a mount of the production the device is not combinenees or in the water of the control of the

create or referee coal to a fine mesh, to distri-buse the reduced soal uniformly over the grate to the first of the coal to the coal to the orthogonal country of the coal to the first and couplers considered thereof, to agitte the grate constantly at sleer motion with a view to keep the first chance from dead converted to the coal to the coal to the coal to agitte the grate constantly at sleer motion (SMARING-III BLEER, JR., New York, The coal to the coal to the coal to the coal grating converted as divice in which a gra-unterwined speed in a revoluble member forces previous may, by distoring at the signal, tell whether the opened is above or below a pred-mit of the coal to the coal to the coal to the ADVINIATIO BOOK APPETE HEAVATOR BOOK ADVINIATIO COAL TO THE MANATOR DOOK

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AUTHMATIC SAFETY BLEWATOR DEOR
OPENER AND CLIMER—F F Both, Philadel
phis, Fs. The main shock of this improvement is
to provide a device whith will be operated by
the sievator thereit to open the door when the
alterior steps at the adjacent foor and to clean
timendiately when the sievator is moved up or down

mechanica and the moute ampiorer ter mantending uniform services the cultur revisioning
poperation.

MONN DOX.—W. A CREATE, Smithwill,
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(Continued from page 84.)

STRONG STRONG STRONG STRONG (CONCORDED From page 21.) trifugal force affected by the band, causes

the ball to everte faving its flight. In the operation, through the hand is re-valved, the drum upon which the ball justs in the plan or one is stationary. This device is brought into action when it is destrict to give the ball is "spin." There is a groove in the drum in the plant of the state of the state of the plant is a proven in the drum in the plant is presented in a carried to the same points as the "swerre" pulleys. For imparting a ours soin to hall to sweeve during its flight. In ried to the same points as the "swervo" pulleys. For imparting a pure spin to the ball, the pulley rotating the hand as above described is thrown out of action, and simply the drum in the pain upon which the ball rests revolves during the which the ball rests revolves during the travel of the arm on an axis parallel with the drum and at right angles to the line of flight instead of revolving on an axis parallel with the litte of flight, as in Che sotien to produce swerre. If desired, both actions can be brought into use at the same time, and then the ball is given a compound or refractory gyration—combination of swerve and spin—which delivery puszles the most accomplished betsman because of the erratic and con-

batman because of the erratic and con-stantly varying rotary axis of the ball.

The device is aptly suited for practi-ing purposes. The relocity of the ball can be altered at will, and there is a "relocemeter" mounted on the machine to indicate the exact momentum during flight. The veriations possible are very ensive, and no two successive balls ad be delivered alike, the change being seted without the batsman being aware effected without the balman being aware of the fact, or if desired a certain type of delivery can be repeated as his Every gyration can be adjusted as desired, and indeed it is possible to mechanically re-produce the deliveries of any particular bowler The "break." i. e., the tangent to right or left produced when the ball to right or left produced when the ball strikes the ground, is measured by a graduated sight, which also indirectes the swerve of the ball to one side or the other during flight Similarly, the ball can be made to leave the "hand" at any point of the arm's travel, here being a series of stops to secure this end In this series of stops to secure this end in this manner the pitch of the ball, that is the distance from the machine to the point where it comes into contact with the ground, can be easily varied, and similarly the balt can be made to strike the ground in such a way that after the im-

act it shoots forward at great speed The machine is mounted on telescopic ggs, and the height of the delivery of legs, and the height of the delivery of the ball can be made to coloride with that of any bowler whom it is desired possibly to instant, the variable range being from six to eight feet above the ground. The mechanism is also arrandom arm can be pointed in any direction without moving the body. The arm is brought to the horizontat position by means of a lever, by which it is also trained and released to sure to be released to sure to be been the coloride to t

AUTOMATIC BAILWAY SAFETY STOP. (Continued from page 25) duced the locking wedge into its normal

The remarkable safety of this apparat

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(Consistent from spec sea and an antimation. Much smaller quantities of graphits occur as fackes in many of the grantities and in the crystalline limestones,
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band cleavags. In these cases, accordties to Dr. A. In Commanswamy, the digraphite behaves life the other accessory
miserain, and there is no reason to suppose that if has been subsequently introduced.

Evidently the graphite in the veins has been deposited at a time posterior to the consolidation of the granulites, and they are of the most typical character Usually Evidently the graphite in the ve are of the most typical character Usually they consist of pure graphite with occa-sional evidences of more than one period of deposition in a soned structure of the vein Metamorphism of the surrounding rocks near the veins is found on only a small seals, the rock surfaces in immediate contact with graphite being impressed with the carbon to move than about half an inch. Neither are the about half an inch. Neither are the write the graphite vein filled with disseminated graphite, the latter cocurring only in strings filling cavities or cracks in the quarts. It is evident that the deposition of the graphite must have been from vapour or liquids saturated with The bads produming districts are Keing rocks near the veins is found on only

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(Continued from page 5b)
with the mineral which under the fric
tion of the bare fact has a most brilliant
polish and is dangerously slippery ex
cept to the active mevements of the

miner
The graphite is excavated by quality oruse tools and instead of being believed to the pit month by role and rull y is loaded into tall baskets of nativ nanu leaded into tail beakers of native name facture resembling small harr is loaded on the shoulders of the native who car ries it bedily up the long ladder to the pit mouth As a result in a busy pit there is a constant endless train of as cending and descending natives bearing their baskets swarming up and down like

their bankets awarming up and down like files their bodios covered with rlumbago brightly polished giving them it ap-pearance in it samlight of moving fig nrea wrought in bright steel Should the pit become flooded a simple system is adopted A rule conduit formed of kingths of wood placed diagonally together so as to afford a V chan nel is improvised which leads to a lower ievel a small orifice being bored through the side of the pit if necessary to secure
the outlet. The water is baled out by na

tives equipped with small vessels

At one or two of the pits where the At one or two of the pits where the wries are abnormally thit some, pre times to modern mining methods is made the water is removed by the aid of sizem tumps and the native article are it imps and the native article are it is a size of the property of th

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phite that ensured as a result of the South
Afrikan war when \$31 per ton was re
alised a plumbago fever broke out among
the natives Su h a price induced indi vidual working and tilicit mining on crown lands Even to-day the latter traf fic takes place Should the mineral be fic takes place Should the mineral be proved to exist on the government prop-erty licenses are dily issued by the anthorities to respectable individuals to exploit the deposits but the natives re-sort to posching. The graphite as it is mined is taken

to the cleaning and grading works. It is first submitted to a preliminary hand se lection all the large plots which are for the most part pure graphic or are associated with pyrites and scientic beassociated with pyrites an i sei-mite be-ing piaced on one side. The six-vas com-prise screens of varying mesh stretched on wooden frames inclined at an angle over which the mineral is emitted from small shailow baskets and then ruhbed smail shailow obsects and then runned by hand the larger or coarser pieces fall ing to the lass of the screen wille the minute particles lass through the meshes This process is repeated several times work being commenced first on the small est meshed acreens. In this manner the dust and much of the frishie loose earth is separated. This phase of the work is carried out by women and children

earried out by women and children Bifting completed the graphite then undergoes leaning. The product being hrought in from various localities may be found associated with other ratter a: h as ironatone or carbonaceous d posits of various descriptions and this detections material is removed by hand. This operation also serves to separate the min rai into two qualities the market price

eral into two qualities the market price of whith averages from \$17.5 to \$300 per ton for the first and from \$0 to \$135 per ton for the second grade. The industry has strained great pros-perity poward of \$0.000 natives being am p oyed in the mining of the article the value of which production considerably exceeds \$5.000.000 per annum. The in accesson \$0.000 for per annum The in dustry is also for the greater part in the hands of the natives many of whom have amassed considerable fortunes since owing to the cheapness of the labor, ample supplies of which are readily avail(Concluded on page 26)

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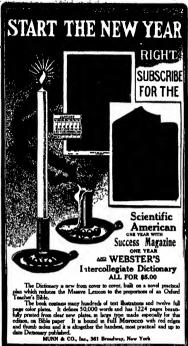
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VERI precised nechanic, whether anators in professional, and the control of the secretary of the secretary of conditation between the control of the

p n Werkshop, II. Elsey Kurke. III. Soldering of Metals. IV The he Prectory U. The Handy March Experimental Laboratory VI. The Soldering of Metals. IV The Handy March Experimental Laboratory VI. The South IX. Model Toy Plying Machines. Index.

MENDES CONTANY, Inc., 341 Broadway, NEW YORK

(Concluded from page 27.)
able, while the capital outlay is suitil,
a handsome profit is secured. The indus-try is however somewhat controlled by
the government, which issies an export duty of about \$2 per ton, representing an annual contribution to the revenues of the island of about \$100,000 the island of about \$100,000. The in creasing extension of crucibles in the metallurgical industries, and the result ant increased demand for graphite is re sponsible for the present fourishing con dition of the industry.

Weven Aleminium.

Weven Alaminiams,
Aluminum, as is well known is ex
tracted from clay and it was Napoleon
who styled it the "silver of lay" Pormerly it was its practice to extract it
from the clay with the aid of reforts
More recently the electrical current is
employed for this purpose with marked
success, the cost of producing this value. aucesa, the cost of producing this valuable and by no means fully nillided metal, having by its comployment been very much reduced in 1860 a pound of aluminium cost about \$40 now adays it costs only about 20 cents. Above all other metals, aluminium has the greatest about the greatest with the greatest durable lightness with the greatest durable. bility and toughness It can be rolled, cut and drawn exceedingly fine. This has made aluminium valuable and useful in the textile industries. For many years, woven sleves or screens have been made of siuminium, which have proved indis-pensable in the sugar refining industry Its principal advantage consists in the fact that the aurface of the aluminium, on the slightest exposure to the air beon the singuler exposure it in air be-comes covered with a coating of oxide which is capable of offering almost per feet resistance to foreign infinences such as acids, etc. This is likewise of great importance where sluminium is used in the textile industries.

the testile industries

Speaking of actual scavins, of alumi
nium into apecial fabrics, particularly
auch as are intended for use for devertre purposes and coatumes, it may be
stated that this is well and successfully
practised in Ensiand. At the time of the
Paris exhibition, there were about as
special attractions fabrics and cickness
and from glass fiber. They were made
from glass fiber a They were made
from the fiber and cickness
fabrics and from aparitions do not
and cincipation with other tailie
yaras Of late the most beautiful effects
have been obtained by employing alumihave been obtained by employing alumi-NATES Of late the most beautiful effects have been oblished by employing aliminatum in smooth as well as twisted threads for the varp and as let wert alik warn of any desired color. They are used for evening clonks and theuriful resistants. As the fixuli Woche says it makes the bed, of a beautiful soman took as mough dipped in aliver. From cloth produced the same and half, and it is hard to present he all int for the possibilities of prescribe a lin it for the possibilities of this melai Very striking are net fabrica in combination with aluminium which constilled a select novelty for interior decoration. Aluminium yern made up into faces for ladics' shoes as well as used for straps, promises to ise a feature of the coming season.

It would be quite an advantage to the motorist, states a contemporary, if he could communicate by wireless o kephone with his garage or the nearest repair shop in case of accident. An American inventor who is developing a system of mercator who is developing a system of wireless telephony recently made experi ments with portable apparalus to deter-mine the range of service of the instru-ment. He was able to communicate over a short distance with a garage in New ark, but at a distance of eight miles the ark, out at a distance or eight miles the apparatus failed Apparently wireless leisphony will have to be developed for bayond its present efficiency before it can be of service to the motorial. The chief difficulty is that only a short transmitting antenna can be used, requiring an enormous expenditure of energy to reach a city garage, because of obstacles in the way, such as steel buildings, trace, wires, etc.



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when of these facts, it surely behoov every thoughtful buyer to inquire in the actmordinary circumstances wis have so firmly entrenched the Cadill in public approval.

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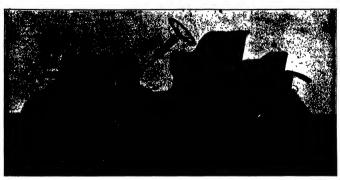








veryman's Car at Last 1910 BRUSH \$48500



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The Brush knows no class; there is no limit to its usefulness. A tried, proven automobile for less than the cost of a good horse and buggy.

MAIL THIS COUPON TODAY BRUSH RUNABOUT CO. of my copy of the near Break Codes

Think of it-\$485 for the best-built, most thoroughly proven, easiest riding, most economical, handiest small automobile in the world!

FIF NEW BRISH RESAUCE not only out-classes all small cars but is far alread of its own previous high standard

previous right standard to lessons all ununfacturers have to learn by experious—ex-ucil brough we have manifacturing facilities as userly perfect as money and brains can make them—still we could not build a car of the quality of the top Brush if we merely initiated the big cars with all their compleated parts and all parts necessarily smaller and weaker

Here's where the genns of the designer counts The Brush has always been and still is the only real Runabout built in America

The new 1910 Brish is tool a designer's thream but the result of years of experience and a knowledge acquired by manifacturing 3,000 Brushes that are in daily use. It is a car which with one chassic adapts itself perfectly by change of bodies to a hundred different uses.

It is a car new in power, smoothness, speed and looks but built on proven principles by an organization already perfected

The Brush has the fewest possible parts but they are of sufficient size and strength to stand the hardest knocks

SIMPLICITY makes it possible to build the carright and still sell it at this wonderful price.

As for reliability their is no comparison between the British and any of the small miniations of large multiceschinder care.

With the new Brush you get single-cylinder sympletic reliability, high weight low gas-oline and off consumption, how the expenses with four-citinder power and smoothness.

Its new balanced motor runs as quietly as a four-exhider and is as flexible. Its power is

astonishing
The most wonderful improvement in Motor Car construction in years
While the balanced motor is the most remark-

able feature of the 1910 Brush, we have made

numerous other nurrowments and refinements. Here are some of them wheel-has kungthened 6 meles more graceful and rakes hines Mercedes type radiator now selective control numeroal couplings-haft, improved dist-proof committator multiple due low and reverse chieles, transmission control levers entirely loneed and oblight more quint multiple for the proof of the lever of the proof of the levers of the levers

SPECIFICATIONS

READ

THE

BRUSH RUNABOUT COMPANY, DETROIT MORE AVENUE







THE WHITE GASOLINE CAR is in a class by itself



If you plan to buy a gasoline car, why not get the very latest construction? You can find it only in the White, or in the 1910 foreign cars at double the White price.

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workmanship make the White gasoline car by far the most desirable on the market.

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only one year to any furtise country postage prepaid, 18s act. 40: 118. S. (18. T.) THE AMERICA PUBLICATIONS UNIFORM CONTROL OF COUNTRY AND A SECTION OF COUNTRY AND A SECT

NEW YORK, BATORDAY, JANUARY 15th, 1910

The Rittor is always gird to receive for examination illustrated articles on subjects of thirdly interest. If the photographs are sharp, the articles shart and the facts multivistic the contributions will receive special astention. Accepted articles will be past for at regular space ratio.

THE 1910 AUTOMOBILE

ONVINCING evidence that the automobile of to-day is as far perfected as the ma ti risks of construction and mechanical in genuity will allow, is afforded by the fact that the cars shown in the two annual exhibitions nat that the cars shown in the two annual exhibitions this year exhibit no novilles of a radical character as compared with the cars of the preceding year. Indeed, were it not for the relatively short life and high cost of the tires, the automobile would surely be entitled. to rank as the most perfect and economical means of transportation of the present day. As to whether some cheaper and more durable substitute, having the same resiliency as rubber, will be found during the immediate future, we can only say that there is not immediate future, we can only say that there is not at present, as far as we know, any promise that such a substance will be produced. At the same time, the development of the car has been along lines that are highly favorable to the life of the tire, for both the signly favorable to the life of the tire, for non the weight and the horse-power have been greatly reduced Moreover, the average owner is beginning to under-stand that the exercise of discretion in the use of the in avoiding rough places on the ro slowing down at curves, will add from fifty to one hun-dred per cent to the life of the tires The tendency toward standardization is even more

The tendency toward standardisation is even mor-marked this year than last, and the freak car is ron spicuous by its absence. The predominance of the four-sylinder motor would indicate that this is to be the prevailing type of the future. The six-ylinder motor is being made, but its spice of its acknowledged advantages of more oven torque -ic., it is mainly con-fied in expansive cars of high power. An sensourag-ing feature, based upon thoroughly sound mechanics, at the increased length of stroke, two of the leading form 30 ph. 10 ph inches stroke respectively
indoubtedly, the present dood tide of prosperity b

the automobile industry is due largely to the fact that a multitude of people of moderate means, who have been waiting until a thoroughly serviceable car embodying the intest improvements was placed on the Several makers are offering a four-cylinder 20-horse-power car having all the features of stylish design, accessibility to the parts, and case and certainty of control, of the more costly designs for the low price of \$750 Cars of this type have proved during the past year that with judicious handling they are perfectly well able to stand up under constant and severe service For all cars the four-cylinder, four-cycle engine, with variations in the valve arrangements to suit the tastes of the various builders has become the standard type of the various builders has become the standard type, and the indications are that ultimately the cylinders will be east on bloc. Crankshaft ball bearings have given place to babbit paralist bearings of fiberal area, although a few first class makers are using a modified ball bearing with an outer rotating ring. For axies, although a few still use the balls, the roller be seens to be established as the standard practice

There is a practically universal use of high-tension ignition. All machines down to the lowest priced ere magnetos with either a four-cylinder coll and timer as auxiliary or a dust system of ignition timer as auxiliary or a dual system of ignition. The shaft drive is a immost exclusive use, the chain being retained only on very large care. The transmission, except on the smallest care, is almost invariably of the siding and selective type, with three speeds ahead and one reverse and the excellent results ob-tained by those firms which have placed the transmis-sion's fast, the excellent results and the state of the contraction of the contrac into conered fever

n is effected mainly by two aystems, or

employing "splash" librication, in which the cranks pass through a bath of olf contained in the bottom of the crank case, and the other employing a trough and r pamp, which causes a constant and positive circular into through a wary hearing of trained of a tendency to clarge the size there are no notable changes in the airly mechanism of American oran, and it is rather

varie mechanism of American cars, and it is rather remarkable that, in spits of the increased use which is being made abroad of the silds valve (a distinctly American invention), there seems to be no disposition to develop this type in the land of its birth Although the multiple-disk clutch hids fair to become the exclusive type abroad, the familiar, leath covered cone clutch has rendered such excellent se ice on American machines that it still holds its own, and this in spite of the fact that the mnitiple-disk type

has been giving good results on such American cars as carry them
In the mannfacture of car bodies, there is a marked tendency toward the adoption of straight line designs. Several stylish-looking cars, both of medium and high

, are shown with the much-talked-of torped in which both the front and rear seats are an body, in which both the front the year sears are un tirely inclosed, the cars being provided with side doors, forward as wall as behind. The provision of doors that open toward the front instead of toward the rear is commendable, both from the standpoint of conven-ience and safety An additional advantage of the torpedo body is that it provides excellent prote against the rush of air, particularly on high-speed ed cars. A notable tendency of the times is the growing popu-ierity of wind shields and "tops," the appreciation of serily of white aminos and roys, the appreciation or the former being due largely to the general objection to wearing goggies. The use of tops renders the mo-torist comparatively independent of the weather, and they unquestionably add to the alt-round comfort of touring

The question of the relative advantages of the righ hand and left hand drive is coming to the front, and some makers are offering cars with steering wheel placed at the left of the car Unquestionably the right hand position is preferable in those foreign countries here the rule of the road in meeting and par the opposite of our own There, in meeting a car one passes to the left, and the driver, if seated on the right of the car, is in a favorable position for judging of the of the car, is in a tavoranie position for judging of the mecessary iterature. In this country, where the rule of the read is reversed, it would seem logical also to reverse also the position of the driver. The handsome display of motor trucks forms per-haps the most notable feature of this year's exhibition.

no less than seventeen different makes of comm no less than seventeen different makes of commarcial motor whiches being above at the Grand Central Pai acc. In quality of design and workmanship, and in the variety of uses for which to valicies have been built, this section compared favorably with the best work above in the other automobilis chilbits, and as one passed from onto the another of these powerful makes and noted the executions combination of compact thines and noted the executions combination of compact thines and noted the excellent combination of compact ness and great engackly the impression became strong that at length after many years of discouragement, the motor vehicle had come into its own Certainty the statustics of the trade bear out this conviction, for its estimated that during the coming year about fifty thousand commercial vehicles will be built in this country alone. This gratifying result is the outcome of several years of careful experimental work, in which wholesale houses department attors, angives compan-ies, and the business department attors, and the state of the control of the control of the control of the con-tinuous control of the ditions of traffic, both in summer and winter That the manufacturers themselves have faith in the future of the industry is proved by the fact that, in several or the industry is proved by the fact that, in several cases, they are considerably enlarging their plants to meet an expected increase in the demand, and one firm atone in the West, is to-day in a position to turn cut five thousand motor vehicles for commercial tass

IMPROVED QUALITY VERSUS PRICE REDUCTION 1VE years ago or more, when a man paid \$2,000 or \$2,500 for a touring car, or \$650 to \$1,200 for a ranabout, he scarcely expected to get much in the way of reliability and darabilitymuch in the way of reliability and durability-or, if he did, in the cusberance of unsophistical-a-ticipation, he was pretty anre to be disappointed before the had seed the car many days. The narraitra of an antonobler ran in those days was usually a recital of a nories of revolved or various sorts, chiefly with tires, carboneter, and ignition, but also frequently with the hardsage and imperfect functioning of valva mechan-ism, shafts, evers, rhains, and even setting knuckins, driving axies, and other wital parts.

driving axies, and other vital paris. Conditions are very different in the present state of automotito development, when it becomes a matter of surprise to ever well-posted observers that eight cet of thirty care taking part in the Glidden tour of 1964 about finish an articone trip of 3.460 miles was brown Detroit, Chicago, Misosapolis, St. Louis, Detwer and Kannas City in Riven days at an average speed of twenty miles an houst during the daylight reasting periods, without emileting a chight investment of opportunity of the contract of

for repairs, or for adjustments of his way except to heaten, earborstor, this ignition system, and three. Considering the read and wealther confidence under which the work was done and the last; of diffy inspection, cleaning, and adjusting, this probably proposed as higher degree of redirectory and partversance than can be shown for any other inschantest construction.

struction.

The wonderful improvement in motor-car quality made avident by the results of this test and by a comparison of the specifications of the machines of today with those of machines selling at about the same prices in the early part of the decade now drawsame prices in the early part of the decade now drawing to a close, is due to a 'aumber of contributing causes, but to none more than to the production and use of appeals pracked or Statel, broates, aluminium, and use of appeals pracked or Statel, broates, aluminium, and stated particularly to the requirements in different parts of the antomobile The manufacture of first-clase or even reasonably satisfactory moor cars in the country was practically impossible muit the then small group of amperimenter and builders were able to construct meant amministrative of the large possible construction of the contribution meant amministrative of the large possible productions of the contribution meant amministrative of the large possible production. bilities of the automobile industry, and thereby in them to undertake the production of nickel steel and them to undertake the production of nickel steel and chrome nicks itsel for use in rankshelfur, (rankshelfur, (rankshelfur, terministon shafts, driving axies, silding, differential, and sterring gears, isselring kuuckles, and similar parts, and of manganese bronzes, phospher bronzes, and vari-nos attuministum alloys for use in crankcases, gear boxes steering-gear bousings and similar parts demanding-great stiffness combined with light wight. The autogreat stiffness combined with light waight The auto-mobile industry is very largely responsible for the discovery of the physical properties of chrome-nickes steel and vanadium-chrome steel under different modes of heat treatment, as annesling and oil tempering, and for the introduction of the special tool steels required

Before the special alloy steels were brought out Before the special alloy steels were brought our, the motor-ar manufacturers nearly resched the end of their resources in the effort to produce safe, darable care of satisfactory power and speed without excessive weight. The transformation that has been wrought can be better comprehended when it is shown that it is not uncommon for specially treated chrome-cities in the state of the second o pared with 60/00 pounds totale strength of Brouse inn of a quality used by wagon makers and also employed for certain purposes in automobiles. That is a bar of the alloy steel one lich square is expable for a superior of the steel of the strength of the Tha qualities most sought in metals for alloing scars rankshafts, cannahafts, driving and differential pin-ions and pears and it're rear raties are sistellity to resist torsicional stresses and impact, hardness to restat warr, and ductility to bend under heavy shock instead warr, and ductility to bend under heavy shock instead challeting. as it was found in the earlier dars of the elasticity, as it was found in the earlier days of the industry that the soft Swedish iron and low-carbon Beasemer crucible steel would take a permanent set

under the repeated shocks and stresson, and threw the shafts and gener out of sligmons of steel of such won-derful strought in the sliding-gar sets, by way of II instruction, it is now possible to (ransmit the 40 and 60 horse-power of the modern touring car with smaller and lighter gast sets than were used in cars of 12, 15, and 20 horse-power five years ago, and that with much greatur certainty against breakage and the practical elimination of the smalling of the anis of the teeth by meshing and of wear due to consist under the control of the state of the control of the state of the teeth by meshing and of wear due to consist under of the machine that must sustain heavy torstonate, stresses, frequent and heavy impact, or much friction, the designer has been enabled to keep down the weight the machine as a whole. This secondary the series speed, power, quick acceleration, perfect manages ability, and the dependability and the dependability of the care of today weighing little if any more than mechanes of a quester or third the power and half the speed, built carriage the first half of the densite of the care o

an can improvement in quality, plus infinitely move grace in general lines and in confort to the passengers, and a complete equipment of folding top, wind shield, head lights, magneto, and other supenders ethings, is offered to the buyer affixed; at no netwines it cost over the ungainty, unconstortable, and poorty-equipped care-of aix and seven years, see:

The high steam shows levers for August on the Panana, Canal incorration was made by a shorely series in the oblives District, which canalysis (2008-cubic parks of earth in twenty-six westplan size, and above levering sight days in the Chulsen District, shorely writing sight days in the Chulsen District, shorely in the Short's british of the state of the state of the Short's which parks, respectively, if Chuls of March and MARI coller parks, respectively, if Chulse is the state of the short object parks, the second shift proced for the insists, in the Chules District when the Short object of the Short object of the Chules District when the Short object of the Short object object of the Short object of the Short object of the Short object object of the Short object of the Short object of the Short object objec

Scientific American

ENGINEERING.

The Pangine railway, which has formed the subcet of illustration in this journal, is making steady progress. About 120 men are engaged on the tunnel between Hismer station, 10,445 feet, and the jungfreat jock, 13,000 feet above the sea level. The present indications are that the read will be completed toward the class of seatz bear.

Al the last meeting of the American Society of Naval. Architects and Martine Engineers. In a paper on "Applications of Electricity to the Propulsion of Naval." A Committee of the Committee of t

En a somet acticle in one of the magnatice, Admirts Draux takes a rather posimitate view of the future of the Panama Canal. He sees but little revenue in prospect, and apparently be bolds the view that, unless the canal be declared free to at navigation, it will succeed in attracting but a limited amount of abhipting He seems to be of the opinion that it cannot possibly charge a sufficient toil, at itseat during the early years of its operation, to pay the heavy fixed and operating charges.

A piese of \$5,000 has boun offered in England for a twenty four-hour aeroplam motor. In weight the engine must not exceed \$46 pounds, and it must develop not less than \$36 brake home-power. The points of the consultance in making the award will be weight, parts, security against fire, and minimum air resistance. The conditions are severe, but unquestionably the motor is the weakpoint in the aeroplane at the present states of its development.

Emphatic termination and the shifty of relationed one crede to relative extensions that shifty at the control of annoved concrete, according to Prof. Amore, proved to bhighy resistant, and much significance was attached to the case of two reservoirs of considerable size, one of brick and the other of crisinformed concrete. The concrete structure received no linjury, whereas the heit's reservoir was complicitly destroyed.

Recently gathered steam turbine statistics, referring to the growth of this new type of ongles in public favor, show that atthough the first steamer was equipped with turbine as eccently as 1901 there are now skitt four vessels carrying this equipment, the aggregate home-power represented being 6000 tit is estimated that because of the lower pressure which can be used with the turbine, no less than 120 tons of weight was saved in the botter room of the largest of the turbine propelled liners

Resistation population lawy many financial formation. Resistation population lawy many out of 105 preventable collisions and destillments, twenty-one of the preventable collisions and destillments, twenty-one of the accidents were due to the failure of the locemotive engineers to observe the signals. Evidently the human element enters harped just to be question of the efficiency of block signating. In view of this fact, it is encouraging to noise the steady growth of automatic stop devices which, in case of failure of the engineer to devy a signal, will open the train pipe and set the

With a view to guarding the safety of passengers and preserving the life of rails and relling stock, the Chicago, Milwankee, and Paget Sound Railway will refrain from running high-spec drains over the new readded nutil it has had time to become thorought; compacted and a reasonable amount of stone or gravel ballant has been samped beneath the ties. It takes the contract of the co

contily work in renowals and upkeep
Asy ose who was familiar with the appearance of
the Niagara Falls before the present power installs
tions were built and opessed, on settle the quostion as
to whether the appearance of the falls has been affected, by the simple expedient, of going to see for
himself Small though the total amount of water
taken for power purposes, the proportion of the total
amount passing over the falls, may be, it has been sufficient to ensue the shallower portions of the overflow
of the degree of the falls to become senting they they
greatly redecoding the total length of the overflow

greatly reducing the total length of the creek line.

During the hat month of 1906, electric service was
inpagurated on the newly electrided portion of the
London, Brightnia and South London Line, which extends
they nelleniar portion placed in such service being
thrown as the South London Line, which extends
nine miles from Vikitoria to London; Bridge Formerty
now it is twesty-free minutes, and trialse run at teaminutes intervals. Operation is by the overshead allerminutes intervals.

ELECTRICAL

A recent proce report states that a chain of wireless stations is to be established by the British Admiratly in the Pacific Coan. High-power stations will be placed at Sydney, Doubliess Bay, New Zealand, Suwa, the capital of the Figl group, and Ocean island with medium-powered stations in the New Hobrides and Soiomen Islands

A new device for connecting wires has just been put on the market it constitute of a silector adjusted on its over the wires, which is filled with a requisitio amount of softer. The silector is formulated with material which when glated produces sufficient has its melt the softer when glated produces sufficient has its melt the softer and firmly softened in this position. The devicer and firmly softened in this position. The devicer constraint of the softened in the position of the position of the softened in this position. The devicer and firmly softened with a match. The advantages of such a system of connecting wires will be appreciated by those who have tried to solder joints on overhead times.

The voltage on power transmission lines has been rapidly increasing, and at such a page as to simust take one's breath away. The development has required a similar aviance in the design of transformers capable of taking the high-tension current and reducing it to a lower and more serviceshie voltage at the points of distribution. The latest transformers of the type have a capacity of 1.750 billowatts, and are capable of taking a maximum voltage of 113,500 and reducing it to 11,700. Those transformers have been built for the Ransiasus Power Company of California Radio Internationary until weighs about 25 tons complete stands 17 feet high, and occupies a floor space of 9% by 5% feet.

For the past three years meet has been circle by selectivity in much less time than was required by the old method. The meet is placed in large wooder tanks and covered with the ordinary pikit. An after nating current of 35 amperes at 35 voits is passed through the vat, the estimations serving to prevent electrochemical action. Carbon electrodes are used, with an avarrounded by porous cups that dip into the brine. The coat of curring a vat full of meet from the country of the current of the control of the current is advertised in the brine current is advertised to the current its distribution, except for the loss of in greedents taken up by the measurement.

According to La Lamieve Silvetrique a new microphone has been constructed by Meware Carl Emer and
J Kannar, of Holmstreem, Sweden, which will with
stand a current of ten in officer amperes. The details
of the instrument are not given out, owing to the fast
at it has but yet been prototed by pateriar. The
Swedish government resoluty connected several telephone lines, forming a line severy insteem and
wary clearly over this circuit, whereas with the or
dinary apparatus no audilies sounds were produced.
The new transmitter is being used in the Pushen
relices telephone system and it is talamed that con
versation has been curried on over a distance of 178
miles, using a high frequency current of six amperes

The Nery Department is giving its extract support to the hill introduced by Mr. Roberts, who is a mem ber of the Hones Committee on Neval Affairs, to conto amateur wireless telegraphy Mr. Roberts s measure calls for a board consisting of seven members, one expert each from the Nary, War, and Treasury departments, three experts representing commercial writesse telegraph and deephony in the proposed that the operations of the analysis of the day, and that each operator be required to take a manufact telegraphers be confined to certain hours of the day, and that each operator be required to take out a license The Nary Department has recently for warded to Mr. Roberts extracts from the logs of revenue to the control of the difficulties with

With characteristic thoroughness the Prumina Gorerment Enlivery have been investigating the best roadbed for their lines, also the best trolley systems and motors. About 30 miles from Berlin is an outshaped experimentar milway of about a mile in length Part of the roadbed consists of wooden ties, and as other part of metal ties. Various kinds of ballest are used, and writton suchoed of connecting the rails and ties. Over this experimental relivery an electric trails the days, and in this way it is possible to determine which form of roadbed will best stand the wear of stund service. The overhead system has been changed from time to time, and different forms of collectors have been used. At present the loomotive on this line is being driven by Winter-Richburg single-piece sees to use motorus mented on the floor of the loomotive, and enable-connected to the driving wholes.

SCIENCE

A moving picture operator was taken up by Latham recently on a seven minute trip, at an olevation of eighty feet from the ground the lens pointing downard. The apparatus weighed 300 pounds, and its operator 186

These scouns to be once, oridence that pulsatory oscitations of the earth a count increase where there is a strong harometric gradient in the strong harometric gradient the wind. The phenemenn has been not related to two Japanese scientists, one of whom, Omeri, has shown that the searths pulsations are due to changes show that the searths pulsations are due to changes in the pressure upon the earths ereal caused by baremetric changes or by accompanying changes in the metric changes or by accompanying changes in control of the strong of the control of the control of the strong of the strong of the control of the strong of the strong of the strong the strong of the strong the strong of the strong of the strong of the obtained records of pulsations with components of obtained procedure of the strong of the obtained records of pulsations with components of obstances.

The blanket effect of clouds, their power of conserving terrestrial temperatures, is discussed by Mr. w. W. Cobbatta in recent number of the Monthly Weather Review III says that this hisnive effect of clouds as due to their have measuring for radiations emitted by due to their have measuring for radiations emitted by the comparison of the comparison of their power and have to their high efficiency as heat radiation. Back body should have no reflecting over and sheet between the same three districts of per can of their water reflects only from 2 to 5 per can of their power power and their power power and their power power power and their power power power and their power power

The trooting of lines may have a greater effect than is expected of 1. As the temperature of the true may grantly exceed 356 day F. It has been suggested that the provess of trooting may saidly exceed 356 day F. It has been a suggested that the provess of trooting may saidly a superior of the contract of the provess of trooting the saidly of resident and the provess of the prove

Prof. Ady has studied the ratileactive properties of the many laws, especially toose of Vasuvias. From his results it appears that the Vesuvian laws, from his results it appears that the Vesuvian laws, from 1831 to the present day, are remarkably rich in radium compared with other laws, the values ranging up to three times the normal for ignous recks, and sometimes veen higher than that The thorium content, although large in comparison with what gonerally prevails in the rocks of the 80 Gothard series, is not considered in the vesuvian rocks than in the rocks from other volcances. The highest reading was obtained from the Krakatan pumiler. The Vesuvian bottime from the Krakatan pumiler. The Vesuvian classifier of the vesus of the content of the c

Note ious ago Peri. Turner proved that gold head Not as insuperent shee based in consist with glass. This interesting phenomeno has been during tutled by Messer J. C. Chapman and H. I. Porter without the use of glass. In their experiments a piece of gold leaf was hold by its edges to a platinum loop and heated in a double-walled quarter runtille. As becoming more tank, and the properties of the conbesting continued it was noticed that the gold losf was becoming more tank, and could be considered to a samicing it may be the continued of the contraction of the contract of the contract of a samicing it interesceptically after remeal its strucquent experiments with the leaf hanging like a blind with a weight at the bottom to put it under definite tomaton showed the contraction temperature was nearly with a weight and was about 140 de get. With gold were employed the contraction temperature was nearly the same in all, and was about 140 de get. With gold were instead of leaf no contraction took place the tractic and the contraction temperature with glass is attributed to the contraction to white glass is attributed to the contraction to the contractive case in laterals between.





THE MOTOR CAR AND THE ROAD.

THE DESTRUCTIVE EFFECT OF HIGH SPEED.

BY LOGAN WALLER PAGE

DIRECTOR OF THE OFFICE OF PUBLIC ROADS, UNITED STATES DEPARTMENT OF AGRICULTURE.



The most serious and difficult problem now engaging the attention of highway engineers all over the world is the preservation of the crushed stone road under the of new methods of construction adapted to the require ments of this twentieth century traffic That the auto mobile has come to stay no one will dispute. It is estimated that there are already about 250,000 ma-chines owned in the United States, and the number is and the iron-tired wheels passing over the road from time to time were depanded upon to wear off a suffi-cient amount of rock dust to replace that carried away by wind and water, and this, under the sotion of moisture, recemented, thereby automatically renewing the bond of the road surface. When the road was subbond of the road surface. When the road was sub-jected to drought, the conditions were made normal by regular sprinkling With the advent of the automo-bile, a totally new condition prevails. The rubberthe effect were produced by auction or vacuum, the action of both front and rear wheels should be some-what similar at least. It seems apparent to the writer, therefore, that the read best adapted to moter trails is the read which will best resist this powerful tractive is the road which will best resist this powerful tractive shear it has already been demonstrated that no plata meadam road is capable of resisting this force. While the destruction of the road may be considered as the most tangible and serious problem, the dust









Twenty miles an hour.

Thirty miles an hour

Eighty miles as hour.

THE DISIPTERATING RYPROT OF AN AUTOMOBILE TRAVELING ON AN ORDINARY MACADAM ROAD AT DIFFERENT SPEEDS.

increasing at a marvelous rate. In France, which is credited with having the most superb system of roads in the world, bullt at a cost of about \$625,000 000, a great international Road Congress was sanctioned by the French government and held at Paris in October, 1908 So alarming were the ravages caused by motor traffic on the costly French road system that the purpose of the meeting was announced to be "The Ada; tation of Roads to Modern Methods of Locomotion In the United States, the problem as yet is a vital one only near the great centers of population, for the resson that but a small percentage of the total mileage of roads is improved, and the motor traffic is largely confined to small areas of country, but it will of necessity become increasingly important with the constantly in creasing use of the automobile

methods of construction which have stood every test for more than a hundred years are inadequate to most the conditions of this new form of traffic, and that we are in the midst of a transition period which may eventually revolutionize the science and art of the rose builder The highway engineer of today is called upon to ascertain in what way the automobile injures the road what is the exact cause of the injury, and finally to devise an adequate remedy

When Treanguet, the great French engineer, made his eport to the Council of Bridges and Roads in 1775, h set forth the principles of construction which as modified and added to by John L. MacAdam in the early part of the nineteenth century, have proven adequate part or the nineteenia contury. nave proven sacquate until the twentleth contury. These great road builders and their successors sought to secure a road capable of withstanding the wear of iron-tired horse-draws vehicles, for the motor-driven vehicle had no place in their philosophy They worked upon the theory that the dust ahraded from the crushed stone would fill the volds between the angular fragments and when would serve as a cement, thereby making the road face practically a monolith. The iron-shod horses

duce any new dust from the rock, but the tremendous shearing effect of the driving wheels forces the loose dust on the road into the air in great clouds, and, as the body of the machine displaces a large volume of air, the deflected currents carry the rock dust off the air, the deflected currents carry the rock dust of the noud, thereby effecting a premanent lose of the all-ossential binder. It follows that the road is soon strip-ped of its fass binding material, and the npper or even-ing course of the stone is exposed. These stones, to the stone is exposed. These stones, the orbid of the binding material, are soon isosemed by the great shear of the driving wheels, leaving the road body raveled or distingential I it is, of course, appar-ent that the seriest described are greatly intensified on the stone of the stone of the stone of the stone of the Hilbert and mechalical scripters have ever some much

Highway and mechanical engineers have given much udy to the action of the automobile on the road surface, and many ingenious theories have been advanced.
While it is true that the slipping of the tire, the skidding, the shape of the car body, and the suction of the pneumatic tires all contribute to produce the effect, the most conclusive experiments seem to warrant the assertion that the great tractive force or shear exerted by the driving whosis of motor cars is the main factor matic tires all contribute to produce the effe by the driving whoshs of motor care is the main factor is fairury A series of tests conducted by the United States Office of Public Roads in 1908 produced some interesting results along this limit. Care of various weights and types were un over a measured course at different rates of speed and right-easily pictographs different rates of speed and right-easily pictographs racing, weighing with driver and mechanician about a 1200 pounds, was driven over a strucked or read first at five utiles an hour, such run being finereased at the tot of five miles an nour until a preed of 60 miles was attained. Up to 20 miles an hour little or no effect was attained. Up to 20 miles an hour little or no effect was refriring with such increase in speed, when the produced on the road, but from 30 miles an hour the effect was striking with such increase in speed, when the produced by the rear or driving whesis. If

nuisance as intensified by motor traffic is most far-reaching in its indirect effects. It has been claimed te dust produced by man comes that min-femins of the dust produced by man comes from streas and highways and someone has very apily termed the public road the "national dust fac-tory". The effect of the hugo clouds of dust upon health must be very great, as most forms of disease are transmitted by this germ-laden dust. The damage are transmitted by this germ-laden dust. The damage to crops growing adjacent to the public highway through the dust nuisance is real and tangible, and particularly is this true of small fruits. So extreme has this condition become in certain districts that no attempt is made to raise fruit near dusty roads. Its effect upon some classes of live stock is most severe, cattle and horses in particular being susceptible to the cattle and horses in particular being succeptible to the germs of therefulois carried by the dust. The auti-mobile cannot be held responsible for these forms of damage, but it has indoubtedly intensified them. The road builder is, therefore, called upon its many case to mitigate the dust missance by devising a form of treatment which might be considered a pallitative. The efforts of progressive highway ampliours are di

rected, therefore, primarily toward the preservation of our stone-surfaced roads and the construction of dust less roads, and secondly to minimising or mitigating the dust nuisance. The results so far accomplished

the dust nuisance. The results so far accomplished have been for the most part experimental, and but like attention has been given to the actual composition and characteristics of the materials employed. It is ordinate from even the slightest consideration of the subject that the solution of the problem must come, for the most part, from the highway engineer railbor than the sutmostile manufacturers and the reasor than the autonomies manuscurve and telegistator Manufacturers have, to some extent, tried to reduce the dust-rating tendency of their machines by various mechanical devices. Experiments in England brought out the fact that care fitted with bodies having either very great or very slight clearance raised if dust than those with an average clearance. So novel devices were tried with more or less success,



SPRINKLING TAR OF A BOAD AT SACROSS, TREE.



WAGON FOR POSSERS RUPING MITO A RALL.



matterly the year manage

Scientific American

JANUARY 15, 1910.

Deef results being obtained from a car with a fact seed bottom overlapping the sides of the car, and shoes instead of mnd guarda. The tacker screen was at inches from the greene and projected beyond the radiator in front is such dischered with from the present and the car in th



CONSTRUCTION OF BITUMINOUS MACADAM ROAD BY PRESTRATION OR GROUTING METHOD. MEAVY TAR IS APPLIED ON THE TOP OCURAGE OF STORE

a binder more powerful than the rock di a binder more powerful than the rock dust. For the purpose of presenting intelligently the experiments thus far conducted with apecial binders, the term dust preventives' has been applied to all of the various bind has been applied to all of the various bind ers having for their object either the sup pression or the prevention of dust. These may be divided into two classes, temporary and permanent. The temporary binders serve morely as pallistives and require fre-quent renewal, the permanen binders, so called, enter into the structure of the road as a constituent element, and are either in corporated with the other materials at the time of the construction or applied later by a surface treatment

in the class of temporary binders may be included water, salt solutions, light olds and tars, and oil and (ar emulsions, while the (Continued on page 67)



MIXING A RATCH OF MATERIAL OFF THE ROAD BY HAND MACRINE,



BITUMINOUS BINDER AFFLIED WITH BROOMS FROM STEEL WHEELBARROWS.



TARRED STORE DELIVERED ON THE ROAD OF PREVIOUBLY COATED WORK



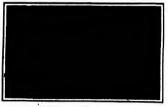
HAND MINING OF BITUMINOUS BINDER ON THE BOAD.



SMITH CONCRETE MIXER USED FOR MIXING ROAD-MAKING MATERIAL.



AN OLIGOT LEGICK BOAD AT THISWTOWN, ALA.



APPLYING SPECIAL TAR SINDER AT WESTWOOD, MASS.



SUBSTANCE COURSE REPORT BOLLING





APER BEING CHILDREN | BOLD IN PALIBERT PARK, PRILADELPHIA | APER BEING SERVICED TO SPEED. | 100 APPROXIMATION TO SPEED. | 100



APPLITING A STEAL COAT OF TAR TO A ROAD BUILT RESTOLALLY FOR RIGH-SPEED AUTOMOBILE TRAFFIC.

MOTOR BALLOON GUNS.

AUTOMOBILE VS. AIRSHIP



It is to their credit that the manufacturers of artitlery should so carnestly have grappled with the new problems presented by the development of successful aeroplans and dirigible balloons and so quickly have designed special ordinance to meet the new form of warfare. The firm which has been most settly in this direction is the great Krupp Company, in having brought out several types of gun, capable of firing at the high angles which will be necessary in order to hit the rapidly moving airships and pis future Because of the extreme mobility of the new ethod of attack from the

air, it is obviously occursary that the means adopted to resist it shall is capable of a correspond is capable of a correspond ing mobility. This is especially true where the warfare is likely to be car-ried on against more or tess rapidly moving bodies

Now the automobile be ause of its speed weight, and strength, is particu iarly adapted, not only for carrying light automatic guns but for affording a platform from which they muy be fired with a res sonable degree of ac-curacy indeed the artil-tery motor (ar armorplated and carrying a gun that is locked firmly to its chassis, is the natural counterpart of the familiar armored train run ning on the rails of the

And although the military regular steam raliroad automobile will be largely restricted to the roads, and will leave them only under exceptional conditions of smooth and fairly level country, the automobile bal-ioon gan will find a field of neefulness in futurs campaigns whose limits can only be determined by the hard experiences of a regular campaign.

Of the three rapid fire-gun motor cars herewith e is American and the other two are of Ge man make One of our illustrations shows a rauld fire balloon gun, mounted on an armored motor car of 60 horse-power The latter, in spite of its weight of three and a quarter tons, is capable of making a speed of 45 kilometers per hour and mounting grades of 22 per cent, even when the roads are of poor quality Tim gun is also shown mounted on a semi-armored can This effective weapon has a muscle energy of 248 This effective weapon has a muzzie chergy of 248 meter ions and an outrome range at an angle of 48 degrees of 7,800 meters. At the maximum slevation of the gun, the shell has a maximum height of trajectory of 8800 meters.

oring of the motor cars consists o steel plates, 3 millimeters in thickness, and the gun liself is provided with a special shield capable of a wide are of siming The wheels, also, are covered

atcel plating The emmunitien. 1. carried in a box undernesth the back seat, and it will be noted that the front of the car is provided with silts for rittemen

The guns are provided with shells of a spe-cial design, suit able for attacking the gas bag of a dirigible or the caovas or rubber-cloth covered surfaces of an aeroplane To assist in tracing the flight of the shells, they are furnished, at the base, with a substance which is ignited at the

instant of firing the gun, and emits a distinct trait of smoke during the flight of the shell. This gives the unner some indication of the error in his sighting But it will be a very difficult matter to more upon

a fast flying machine speeding mile-high above the earth. The most promising form of attack is with shrappel, which, if hurst at the right distance in front of the object, will envelop it in a perfect spray of jagged shell fragments

other illustration shows the McClean-Lis matte rapidifica gun as mounted on a Aton Parkard

ing, for that State will make 113,000 of the total production of 302,000 cars scheduled for 1910. Four one-tion or 307,000 cars sensonine for 1910. Po75 machines. Other States adjoining will contribute 70,975 machines. The Middle West may therefore be said to be the real home of the automobile fudure; Illinois is exheduled to make 18,300 cars in 1910, Indiana, 21,025 cars, Ohlo, 22,750, and Wisconsin, 11,000 In the East, Consection will make 2,100 cars, Manaschusett, 4100 cars, New York, 10,400 cars, Pennsylvania, 3,250 cars, and Rhode Island 800 cars.

These figures are taken from statistics obtainable

in connection with eighty of the prominent auto-mobils companies, and are startling to say the least, both as to their bearing on the location of the motor car industry, and on the importance of the au tomobile industry as a whole In addition, it must be remembered that there are fifty other firms making 100 cars or less, with 150 makers turn ing out a few cars or experimenting

Just why the middle

car manufacture is worthy of some consideration, especially when it is re-membered that much of the early experimenting in motor cars and early manufacturing was done at plants in Buffalo and Tarrytown, N Y, Marlon,

TATTION. N. Y. Marion, T. M. Marion, T. M. Marion, T. M. Marion, Philadelphia. Ps. and other Esstern States. Because of the tremedous revent of the industry in Because of the tremedous revent of the industry in the property of the smouth of explicit and must be property of the smouth of explicit and must be property of the smooth of the property of the smooth of t prise of the middle West, for the securing of hig fac-tories, for the enterprising methods of its boards of trade, and for the readdness to contribute maney toward the securing of new mountaint enterprises, like that of motor-car building Next must be considered the lakor situation, which as excellent in the middle West, especially in the matter of hands for automatic machiner. More of the high reachine machiner. machinery Most of the big machinery making com-panies are in Ohio or Indiana, where machinists of excelsint character are to be had in large numbers.

esides being the center of the machinery trade, the die West has been the headquarters for raw material to a very large extent, at least after it has been put through its first or second process, as in the case of rubber, steel, leather wood, brass, and other things

used in the mod

ern motor car More important than all is fact that the middie West is the portation, a most important it s m important it em when the matter of freight on au tomobiles is con of their high value, automobiles contribute very heavily to the matter of freight care for an extre thousand ratios or so, mesne an add tries to svoid.



HEAVY McCLEAN-LIMAGE AUTOMATIC OUR MOUNTED ON A PAGEARD 8-TON TRUCK

truck, for tests which were carried out last year at Cleveland, Ohio. Lieut-Coi O W Lissack, of the Ordnance Department of the United States army, and Dr S W McClean, designer of the gun, had charge of the tests, being assisted by the Standard Automobile Company, the Cleveland dealer for Packard cars and trucks.

cars and trucks.

The gun fired 3-pound abots at the raise of 100 per minute, the range being 35, miles. Bhols were tried with the brakes of the car see, and also released When the brakes were set the truck did not move, and no shock was rett by those surrounding the gun on the truck platform. With the brakes released there was a silkth movement on the rovell, but no shock. The designer of the gun recommends its use on a rirck such as a the Fischard, but ammored for war furck such as the Fischard, but ammored for war

We hope to publish additional information regard ing the results of additional trials of this gun, which are being made at Sandy Hook and Springfield for the army and at Indian Head for the nav

The Middle West and the Automobile and Michigan leads all States in motorcar manufactur-

**1.2*4 22 į

BALLOGN-ATTAGE RAPID FIRE OUR, WITH SEIELD, MOUNTED ON COMPLETELY ARMORED CAR. WEIGHT SX TORM.

CAR. NOTE THE SEED-SHALL MOST.

ANTI JOY RIDE DEVICES.

BY HARRY WILKIN PERRY.

Bo great a proportion of the many fatal or otherwise very serious automobile accidents chronioled almost daily during the motoring season is the result of the ont the owners, knowledge or conuse of cars without the owners' knowledge or consent, fare demands the general equipment of autor with some means whereby the unauthorized use of ma

positively pre vented If mat-ters continue as they have, it will become in cumbent on ev ery law-abiding and sentlemaniv owner of an au-tomohile to adopt voluntar tive measure, compeliing it are not enacted for the public

"Joy riding"— as the wild run ning of a motor car by a partially inobriated driver accom panied by sever-al hilarious companions has come to be call ed in the automohile vernacu lar -- is of sev may be induised in hy the lawful owner or right machine, by skylarkers pass-ing through the streets and find ing an unattend standing by the curb which can be appropriated, and by chauf feurs employed by the owner or by employees of the public ga-rage where the car is kept, who ally at night, without the owner's or the garage pro prietor's knowl

Laws have existed for some years in a num-ber of States making it a misdemeanor for anyone to meddle with an au-tomobile stand-ing in the street, and prohibiting users of motor ing their ma-

ed with the engibe reinning. During the past winter there has been much activity is legislative circles for the spectross. In the past of laws to prevent 'lay riding.' The New York Legislative yeared a lift containing a provision crofibition without the owner's occases, under passing of a fine imprisonment, or deprivation of the right to use the public road first as mostles, or any or all such past to the public road first as mostles, or any or all such past did not decreased the effects of the forced functionally about its passage, as "in the opinion of the General Assembly as owner; once existing "calabilities are priving room of the control of the contr

knowledge and consent of the owner or owners, whether an individual or a corporation, and Sning the penalities for intraction at a fine of not less than \$50 are more than \$500 or imprisonment for not less than 30 days nor more than 90 days or both such fine and

Such laws will doubtless have a deterrent effect, but

in the way of producing a device that will act as a certain check on the use of the car and yet enable the

chauffeur or the mechanic to clean and adjust the an gine, test the ignition and generally keep the car "iuned up" to maximum working officiency are numer ous and complex Chauffeurs and machinists are clever and resourceful or they are unworthy of their hire A nail, screw, or piece

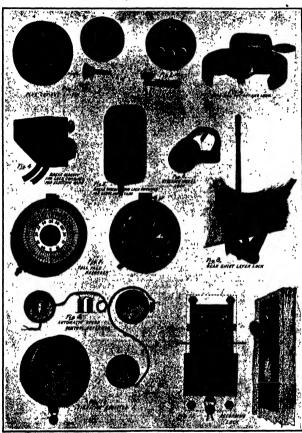
of wire can be made often to take the piece of a removable switch plus or or spurgear ma, urives t Sexible shaft a recording in strument can be discon nected operating part of the motor car is positively locked against action, such as the wheels, steering gear, or transmission it may be diffi cult to move the machine rage, as frenecessary for washing repair ing, or in event of a fire when have to be hur riedly pushed into the street Mechanical devices that have een invented with the object of affording par tlai or complete protection to the owner against the unauthor ized use or over speeding of his car may be di vided into groups as fol

Devices to prevent the on rine from being the car is left standing in the street embrac-ing (A) ignition switches with removable con tact pluga (B) ignition switches that can be locked in inov

erative position 2 Devices to lock essential operative parts, ombracing (A) steering wheel lock and (B) apeed change lever lock

3 Speed iim iting devices, embracing (A) instruments intercon nected with a speedometer and the spark or throttle control so that a given speed cannot be exceeded, (B) audible signals sounded automatically when a preaudible signate sounded automatically when a pro-determined speed is attained, and (C) speed indicat-ing devices with large disis prominently placed so that they can be read at a distance by policemen and

others others
4 Vehicle movement recording devices embrasing
(A) vibration recording instruments of the ps dometer
type, and (B) clockwork registers in which permanent
records of the time, extent and rate of movement are (ventinued on page 58)



ARTI JOY RIDE DEVICES.

they are difficult of enforcement and are positive pather than preventive, applying the pushishness after the evil has been committed. The abuse of studen-biles as distinguished from their proper and most de-sirable uses has reached such enfous proportions as to call for the general application of machanical and auto-matic means whereby the unsurfulprised use of a ma-chine task be positively the properties of the con-traction of the properties of the ratify upon its commission. Inswession has been con-inguished to a ratiety of devices have been put on the market to fulfill the desired ends. The difficulties

WHAT THE MOTOR VEHICLE IS DOING FOR THE FARMER.

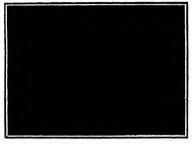
BY WALTER LANGFORD.

Less than five years ago farmers generally looked upon the automobile with bitterness and condemned it as a "toy of the rich". To-day, there are farms com as a "toy of the rich " Yo-day, there are farms com prising hundreds and even thousands of acres, on which nearly all of the heaviest work is done by motor vehicles. There is hardly any part of farm work that cannot be done more quickly and with greater satisiuxnry and time-saving ability of the motor car He balances off the cost of a tenth or a twentieth of a gallon of gasoline per mile traveled against a third or gasion or gasoline per mile traveled against a third or half bushed of oats a day at 65 cents a bushed, whether the horse is working or is standing in the stall on a rainy or a winter day, and reckons the time saved to himself as mainly pure gain

rean, high clearance above the road, a thoroughly pro-tocted engine and transmission, reasonable price and low fuel consumption and maintenance cost have con-tributed toward making this model popular with the rural buyers. From the statements of hundreds of users, it is found that the average cost of upkeep is not more than two-thirds that of keeping a horse. The



MINITER RIGH-WHEELED MOTOR WASON CARRYING A LOAD OF PARM PRODUCE.



CARRYING CRAYED OF OTHER AND ROOM TO MARKET

faction by the use of motor power-either applied to e self moving machine or in the stationary form— than with horseflesh. Whether it is making a quick trip to town with a load of butter, oggs, fruit, or veg trip to town with a load of butter, oggs, irus, or reac-tables, to the creamery with the evening's cane fresh milk, to church with the family on Habbath morning, doing the spring and fail plowing, cuttivat lies. resping threshing—the motor vehicle in its ing, reaping threshing—the motor vehicle in its varied forms has become the latest ally of the pro-

greenive prosperous farmer it has been a matter of general knowledge and com mon comment in automobile circles that extraordinary

mon comment in automobile circles that extraordinary numbers of motor cars have been going into the remote sections of Kanasa. Nebraska, Minnecota, the likelotas, Colorado, and even Montasa. Okionosa, and Parsa during the past season. The statement has been made by a man Heemitde with the trade and presumed to be posted that fully one-quarter of the purchase of motor cars west of the Minsistapi during the season of 1969 were made by farmers, and this means a good many when the combined output of the manufacturers of the country for the year ag soom early the little communities in the Middle West, with a population numbering only hundreds or at most a few thousand inhabiliants have begun to be sout of passessing more motor cars in proportion to population than any other city or town in the country, and tion than any other city or town in the country, and to prove it, they congregate all the cars in the village

in Main Street and have a group photograph taken The farmer, who has long distances to go for everything, from a keg of nalls to a paper of tobacco, as works early and late to make up time lost partly in going "to town, has not been slow to appreciate the Scattered all the way from the Atlantic to the Pa-cific coasts there are small fruit and vegetable grow-ers, dairy farmers and poultry raisers who make a ers, carry tarmers and poutry raisers who make daily practice of carrying light loads of produce to market in the tunneau or on the rear deck of ordinary light touring rears. They can leave the borses to work in the field and can make the trip in a third or quarter of the time formerly consumed thereby gaining just that much additional time to be devoted to more work or to reading visiting, attendance at concerts,

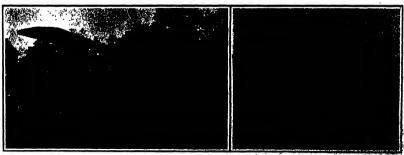
The ordinary four or five-passenger touring ear of modernia power and reasonable price is most extensively used by farmers. Some of the accompanying lituarisations show how such a car is put to practical uses on the farm with the rear seal removed. This is chicago to the general willing automobile of the agricultural sections and is used for a great variety of purposes the section and is used for a great variety of purposes with a rest of wire to repair the fence, runs into town with a rest of wire to repair the fence, runs into town with a rest of wire to repair the fence, runs into town with a rest of wire to repair the fence, runs into town with a rest of wire to repair the force, runs into town with a rest of wire to repair the force, runs into town with the forces of the control of the The ordinary four or five-passenger touring car of addentic power and reasonable price is most exten

mended, carries cans of milk to the creamery or crates of the positry to the express office observing the growing demands by farmers for a care all-around work a wide-awake automobile manufacturing company in Kenonia. Wile, about two years ago began advertising in the farm papers a double-cylinder light touring car at a moderate price, and inside of a year-had as old between 500 and 800 care in the rural districts. There are now probably because the contract of the contract

farmer of to-day is well informed regarding the me-chanical features that adapt an automobile to ble re-quirements and is a careful huyer. He can safely

cannot settine that anothe as attonomes to the re-quirements and a curried hove. He can metaly and can drive ten miles to town in from half to three-quarters of an hour with the load. Largely as a result also of the farmers' demands there has been developed during the lass three or four years a type of motor car called the high-wheeled bugsy. There are upward of fity companies in the country new actively engaged in building this either of motor car especially for use in country either where the reads are rough, hilly, and, according to the season, deep with not, and, or more They are tion, and answer the purposes of many rural dwellers very well. They use only about a gain on gained to fifteen or twenty miles traveled, and a set of nar-row solid tires, counting say 184, will wear a year or more with no expense for repair of punctures or hlow-outs.

Within a year or two there has been added to the two-passenger runabout and four-passenger eurrey models a high-wheel open-bed light delivery wagon model, of the democrat wagon type, especially suited model, of the democrate wagon type, especially mitted to for formers' see. A load of 500 to 500 pounds can be carried in the space beneath and back of the frunt seal, and in soome makes as actric soulce sast can be set in the back to accommodate outra passengers when the back to accommodate outra passengers when which is to be used as a passenger convayance. Other light work wagons with open-back bodies particularly mitted for agricultural uses but litted with bodies. As the control of the contro



AS AUTOMOSILS TRACTION ENGINE USED FOR DRIVING A TERRITISC MACRIFIC.

V PRINCES SHIP ASSESSED STAM AND AND OR ARE SPECIAL

Scientific American

manufactured by several companies in Chicago, Syra-cuse, Eigin, Iil., Dewagiac, Mich., and Littis, Pa. They are escellantly suited to carrying to market good sized loads of vegetables, fruit, dairy and barnyard produce weighing from 1,000 to 2,000 pounds, and for aniling back loads of feed, fortilizer, feeding and nilding materials, farm machinery, and so on The

high wheels give the syles and drive mechanism a good road clearance, the construction is of a heavy able as well as simple

Numerous cases might be given of motor cars put to special service in connection with farming. In Maryland there is a high-class dairy farm where motor delivery wagons are used altogether to distribute milk among the consumers in the vicinity, and in Indianapolis a large milk company is using a 14-ton and a 3-ton graciine using a 114-00 and a bion gasoline are true in the collection of milk ritude in the collection of milk returned in the collection of milk vesture. As a single of the city, which is refused to the collection of the city which collection in the collection of the city of the collection of the city of the collection of t These examples seem to foreshadow the time, not very distant, perhaps, when farmers will find it cheaper and more convenient to ship all of their farm products to market on motor trucks than to haul them with horses and wagons. Possibly the trucks will be owned by local express companies organized for the purpose, which will charge a reasonable price for haulage,

coarge a reasonance price for naturage, so that it will pay the farmer better to keep his horses—if he needs any then—at work in the field, and he will not need to invest any capital in the motor trucks Doubtless some of the transporting companies will use motor tractors, which will run over regular routes every tractors, which will run over regular routes over, morning and pick up a string of farm wagons loaded with produce, hauling them to market and back again for a fixed charge. A single tractor should be able

for a fixed charge. A single tractor should be able to haul four or five such wagons over good roads.

In Connecticut a three-ton truck is regularly used for hauling grain and carrying all sorts of farm supplies and products for a 1,300-acm farm. This is one plies and products for a 1,300-acre farm this is one of the many fancy estates conducted in the East by wealthy owners largely as a personal hobby yet at the same time as a profitable investment. The truck represents an outlay of 8,000 and is kept in a special garage for work motor vehicles which are to be

sed extensively on the farm
A ranch of several thousand acres in Montana is conducted entirely without horses, the plowing, sow ing, cultivating, reaping, threshing, and hauling of the grain to the railroad being done by motor tractors and gram to the railroad being one by motof tractors and motor wagons. We have had the horseless street our for twenty years, the 'horseless carriage" for ten, and now we have the horseless farm. May we hope some day for the horseless city?

While the foregoing examples are isolated cases and apply to farming on an extensive scale with ample sapts, they point to great possibilities for the future use of self-propelled vehicles in farm work, utilizing gasoline, kerosene or denatured alcohol as fuel. The gasoline, kerosene or denatured atcohol as fuel. The farmer with a small acreage who would not be just! feel in buying a motor tractor for his own use, will be able to hire his plowing and threshing done by com-panise operating motor tractors, as for many years he has had his threshing done by itinerant steam threshing outfits. And, incidentally, the work will be done chasper, there will be no danger of fire from fring sparks, there will be little or no water to haul, and thore will be fewer men to feed

In this country, as well as in England and France, there are large companies that make a specialty of



AN AVERY FARM TRUCK MAULING SURAP.

building small farm tractors for universal tractive and stationary power work A company in Minneapolis makes an 8 horse-power tractor weighing 5 500 pounds for such work as operating hay presses corn shellers etc and for drawing wagons and portable machines of this class on the road. In York Pa. is another large company that makes motor tractors and tracsarge company that makes motor tractors and trac-tion engines in ten sizes, from 1,000 to 36,000 pounds in weight. The smallest is rated at 1% to 2 horse-power and is intended for all sorts of farm work such as hauting the ston-beat, churning pumping ed cutting, etc. American motor tractors use

d for plowing and American motor tractors used for plowing and threshing usually develop from 12 to 36 horse power and weigh from 6 900 to 20 900 pounds They hauf gang plows turning from two to eight furrows at a time One of these—a 16-horse-power tractor

built by the largest harvesting machinery combuilt by the largest harwaring machinery com-pany in the world-plowed 19 de acree of "gumbo soil with a three-furrow 12-land hottom plow in an hour and a quater on a consumption of 14 gallons of gasoline per acre at an international competition held in Winnings last July A "wagon fractor, built in Peoria by a great agricultural implement works for general utility

cents an acre for fuel. In a ten-hour day 7½ acres could be plowed for about \$3.25, not including labor. This wagon tractor is a very interesting vehicle It was designed particularly for farm purposes by mer who are familiar with the peculiar requirements, and nts, and nbines in one machine a truck for carrying loads its own body, a tractor for drawing plows and other farm machinery, and a power

plant for driving threshing machines hay balers and other stationary ma chinery by beit It will take the place of several teams and wagons on the farm

wadays, on the farm as well as in Nowadays, on the farm as well as in the manufactory it is nevessary to do the largest amount of work in the short est time in order to make an under taking successful. This is recognized by the progressive farmer and farm machinery buildors and to a large ex-tant the advantages of the motor car-and, motor tractors are successively. and motor tractor are appreciated by and motor tractor are appreciated by builders of farm wagons and huggies Most of the leaders in these fields are now offering their customers a motor buggy, a motor car, a motor wagon, OF & Motor treator

The Medern Floring Automobile BY REST ORCENTELDY ME, B.S.

The beavy cumbersome electric cab or brougham of carlier days has cleared the field for the light runvictoria or interior driven Less weight means more speed and a greater nilling, radius It was looked upon as a great per formance when one of the earlier types of electric automobiles traveled forty miles on a ringh charge of the

tory mine on a single charge of the battery at a comparative joe speed

The modern electric automobile with modern electric automobile with modern electric automobile with modern electric automobile are the motor and controller, an electric automobile are the motor and controller, two parts which are of different design on about every two parts which are of unitret design in about every, other make. For its various advantages the series-wound motor has outclassed its lival of the sarior days, the compound motor. The series wound motor, if properly designed will do its work for three hun dred and sixty five days in the year without requiring attention The most desirable motor is not that th tends to drive a car up a hill at a comparatively any attention high speed A heavy battery discharge is thus en tailed, which is of course very detrimental to the bat tery Of two cars traveling at the same speed on the level, that one will travel the faster on a grade whose controller was not changed. The motor of this faster



TR OTHERT.Y REPAIRED

car is designed for a smaller increase of torque in proportion to the decrease of the speed. Even if this difference in speed is apace Even if this difference in speed is very small say one-bair final so hour the faster car will have to pay dearly for it in current as well as in develope of nite ago radius and in hattery wear. The good designer will find a middle way. He will strive for the highest bettery officiency it is by no means difficult to construct a

c, as the power is unlimited for a short distance The art is to apply the power at disposal in the most alteround satisfactory way and to design a carriage which is reliable and cheap to maintain

a carriage water is remaine and covery to institute in the line of various controllers the drum type for good reasons seems to have grown into great favor The various speed changes can be obtained without arcing or burning, and a gradual increase of speed is effected from step to step with a small los rouse of (Continued on page 80).



purposes in the field and on the road, was tested at the same trials. Coupled to a two-furrow 14-inch gang

HALF A DOKEN CANS OF MILE ARE TAKEN TO THE GREAKERY AND THE BEITTY CARS

plow, it turned over 106 plow, it turned over 106 plows in 1 hour 25 min-sites on a consumption equivalent to 236 gailons

THE MODERN LOW-PRICED CAR.

BY JOSEPH ROGERS.

The automobile buyer faces no such questions 1910 as confronted him a few years ago, when all that was expected of a car was that it would run. At that time the gasoline engine was not understood as the time the gasoline cupies was not understood as the regineer understands it to-sky and all of the parts and appurienances were undergoing a presens of evolution that resulted in such differences between the models of two successive years. Each make had some poculiar-ity of disign, and the actection of a car was compil-cated by the difficulty of getting definite information

There were reliable cars, of course, but their initial cost and the expense of operation made their ownership possible only to the very well to-do. The car that could be bought by the man of underate income reed close attention and the adjustments and pairs that were a constant necessity left him tittle time for anything cls. If these were in the hands of a repair man the monthly hills were out of all proto the mileage covered and the pleasure ob-Automobiling at that time was unquestionably tained tained. Automobiling at that time was inquestionally a diversion for the rich, and it is popularly supposed that such is still the case, but as a unatter of fact, the man of moderate income can to-day juri hase and use a car at an expense that is well within the bounds of

The primary cause for this is found in the relatively close understanding of engine and car design that ob-tains to-day. The systematic experimental work that hus been carried on in the large factories has resulted has been carried on in the large factories has resulted in a refinement in design and an approach to a stand and that place automobile manufacturing on as eco-nomical a basis as is possible in the production of any other mechanism

any other mechanism

The moderate price at which an antomobile may be bought is not due to the use of poor material and theap labor, on the contrary, the low priced car of today is better in quality than tite highest grade cars

of six years sgo
in the early days of the automobile industry t manufacturer was under the necessity of making sit of the paris, to-day, the factories actually making e 75 per cent of the parts that they use are in small proportion to the number of producers. A few years ago, when a manufacturer purchased his engines, change eed gears or other parts, he concealed the fact, today, a constantly increasing number of firms make it no secret that their cars are assembled in whole or in part. It is in these changes in policy that the ex-cellence of the medium priced automobile is largely

The manufacturer of a complete car is under the sity of maintaining an experimental departs in which he can try out augmented improvements on all parts of the chassis. This is expensive work, and a proportion of the cost of the department must be ina proportion of the cost of the despartment must be incided in the price of every car sold. The maker of an assembled car is under no such handlesp, for each of the firms with which he does builness will carry on only such experimental work as is required for its apoctal time, and the expusse is borne hy so great an output that the individual proportion is negligible. There was a time when an assembled car was undembtedly open to suspicion, for however destrous the

makers of its parts might be to do good work they had neither the knowledge nor the facilities that would nake it possible. These same companies now possess enormous plants, their designers and equipment are the best obtainable, and their products ambody the latest and bost in practice material and workmanship. Assemblers thus have parts at their command that are of a high degree of excellence, and can huy them prices that are far below what was charged for the

prices that are far below what was charged for the weak and faulty product of former years. The low prices at witch assembled cars can profit-alty be sold have forced the builders of cars of com-peting grades to manufacture on a very large scale, in order to bring down costs through economies pos-sible only with quantity production Such a firm equips its factory with light and special tools for every operation, and makes it an inviolable rule to accept no order that calls for even a slight deviation from the standard specifications.

When a manufacturer turns out twenty thousand

A recent development that Illustrates the dodesvor

unfacturing costs is the establishment by me of the leading producers of assembling shops at a large centers. To these are shipped parts in suffi the large centers. To these are shipped parts in suffi clent quantity to build the cars required for that lo cality, and as there is no equipment of machine tool the expense is slight. The freight rate on unasser

the expease is slight. The freight rate on unassembled parts is much lower than on complete cars, and the saving effected in time and convenience as well as in money makes the system a satisfactory or more thousand the saving of the saving dorers stated revently that his profit on a \$1,000 car is less than \$100, this is not excessive when one considers his cormous investment in material and parts, his realty variabor expense ally vast equipment of machine tools, and his

labor expense
It has been said that any average engineer can design a ear to seil at \$4.000, but that the greatest skill is necessary when the soiling price is to be less than \$1.000. However that may be, the medium and jown priced cars on the market show exceedingly low designing and bear every indication of the highest grade of mechanical engineering. Being light in weight, the underlat antering into their construction. is selected with the greatest care, and it is typical of the automobile industry that many of the alloy at In common use were hardly more than isboratory curi

The whole tendency of design is to reduce weight and machinery and assembling costs, but it is rare to see a case where strength and durability have been see a case where strength and durability have be ascrilled for economy. One of the features of the 1910 cars is the casting of the four cylinders in one piece, which results in a considerable saving in weight and cost, with no apparent reduction in strength or billity. The increasing tendency to adopt the gravity system of water circulation is another economical move, for it permits the suppression of the nump Tho nuclearital tubristors that were formerly in general use have been abandened in favor of a single nump located in the crank case which is not only less exlocated in the crank case which is not only less ex-pealer to built and assemble, but makes inherication as positive and unfailing on it well can be. The mag-net is now the slandard equipment even for care of very tow price, and quito frequently it is the sole emeans of ignition. An advantage that may be gained through its use in that the spark may be maintained at a fixed point, and therefore he spark control lover and a fixed point, and therefore he spark control lover and its connections may be done away with The tocaling of the ciutch and brake pedais on the gear case reduces the cost of assembling, for when they are hung on a rod passing across the frame as was the practice on a rod passing arose the frame as was the practice in former years, accurate ditting is an absolute and costly necessity. When the engine, shange speed ger-and rear rate are soparate units, assembling is com-plicated by the necessity for setting them accurately in line, in a great number of 1910 cars the change speed gear is either built in with the ongine or the rear acts, and the cost of assembling is reduced in conse-cution.

axis, and the cost of assembling is reduced in consequence
In spile of the excellence of the 1910 cars, it must
not be assumed that the limit of perfection has been
reached Some of the work turned out by the dealguers shown that they have followed a common path,
but in the consequence of the consequence of the consequence
and the spile consequence of the consequence of the consequence
and the spile check of the consequence of the conserved. The great variance in the designs of to-day
is avidence in these that there is still much to learn,
for otherwise, as an example, there would be less
difference in the dismander of the consequence
of the consequence of the consequence of the
same power. The relation of bore to stroke is the
subject of a vast difference of cysics in the present
time, and even the relative length of the connecting
red is yn onessand. rod is by no means fixed

Having produced cars that will run, and that can be depended on for steady service, the problems now before the designor have to do with the increase of af-

before the designor have to do with the increase of a cleary and excoming of operation. At the presen-tions it is doubtful if any manufacture; heaves what appointion of the power of his engine is absorbed in operating the valves, or in driving the magnetic and runs), but there and other for more complicated de-iry of the control of the control of the control of its the principles of the greenst engine are adhered in the control of the control of the control of the features and retained intensions that survive the orders of usage. For the car conner this will need present control of the control of the features and retained intensions that survive the orders of usage. For the car conner this will need to greater concoming in the use of rus, increased sta-picity in construction, and the relations in price that is the investable result of changed-rispless. In price that is the investable result of changed-rispless.

The Wright Suit and Aviation in America.

The granting last week by Judge Hazel of a preliminary injunction restraining Glann Curties and the Herring-Curtise Company from making, seiting, or flying their well-known type of hiplane has quite taken by surprise almost everyone varsed in patent law, as such surprise almost everyone varsed in patent law, as such an injunction has been granted very rarely, if ever, before upon an unadindented patent. Even in the case of the Belden patent covering the use of a clutch between the motor and the road wheels of an autooccurrent the motor and the road wasses or an auto-mobile—a case in which an infringement was much more apparent—such an injunction was not granted. The granting of the injunction at this time has had two results. In the first place it has intimidated a good many inventors who were hard at work upon the per fecting of the aeroplane, and secondly it has encour feeting of the aeropsane, and secondly it has encour-aged the Wrights to attempt the creation of a monopoly in flying mas hines. With a million-dollar company back of them, and with orders already booked aggregating more than this figure, the granting of the pr ent injunction gives them practical control of aviation In America. A second step in this direction occurred on January 4th, when aviator Paulhan was served on January 4th, when aviator Paulian was served with a notice to appear in the New York District Court ten days later to show cause why he should not be enjoined from flying his Farman hiplanes in the United States. An ea is booked to make flights at the Los Angeles aviation meeting from the 10th to tha 20th, this action may be a serious blow to the first aviation meet held in this country The death of i.e.on Delagrange from a fail sustained

The cash of I-col polagrange from a fail sustained as a result of the breaking of a wing of his Bieriot monoplane while flying in a 20-mile wird at Pau, France, on the 4th inst, has given aviation another schaek that it will take a long time and many excelent demonstrations to overcome Four lives low within the last four months is a record by no means anin the seat our months is a record by no means and coursing to sportsmon, and unless everything possible is done to encourage flight in this country, non-of the ascopiane factories soon to be started will do much business for some time to come

Hydrogen for Infating Pneumatic Tires.

The inflation of an automobile tire with a hand The inflation of an automobile tire with a hand unuit as o inhorinus an operation that some auto-mobilists carry cylinders of compressed air, with which a tire can be inflated easily and rapidly The cylinders, however, may be found empty when they are most needed Drouvity a Freach manufacturer of aluminium paper, has conceived the idea of replacing the air by bridgers managed by the attent of restant aiuminium paper, has conceived the idea of replacing aiuminium paper, has conceived the text by the action of water on appelaily prepared ainminium waste. In presence of aiakile, aiuminium decomposes water into oxygen and hydrogen. The oxygen and hydrogen The oxygen combines with the alum nilum and the hydrogen is after three The method of operation is vory aimple About 10 course of granu tacked aiuminium and 10 sources of water are introduced aiuminium and 10 sources of water are introduced. into an air tube of the capacity (5% pints) which is commonly furnished by the great tire makers, and commonly furnished by the great life makers, and the branes plug is quictly screwed down in a faw seconds the space not otherwise occupied, about 50; pluts, is illed with hydrogen at a pressure of 150 latinosphores This is equivalent to more than 100 galicos of bydrogen at atmospheric pressure The other product of the reaction is situation, which can easily be wanted out. This special preparation of the aluminium consists in the addition of a small per-ventage of mercyl philoloide which starts the reaction in the absence of alkattes so that pure water

in the absence of aintaine so that pure water can be employed. On common two deviatages. It allows the property of the propert

To American who are acceptanced to freezest, our fulgs, it will be surprising to learn, on the softman fulgs, it will be surprising to learn, on the softman fulgraph of the function, that least mostly there was a selection or service from the or the London subway (table) sustions to the dishert of North Pinchley, on which a fare of helf a clight will be children. To Americans who are accustomed to five-12 . .

HOW TO OVERHAUL A CAR.

BY HERBERT L TOWLE

In these of importance, the facilities needed rerestricting as a warm, light place to work, as acticated adoptic light, a beach, served boxes for use as needed, and supports for the dissimating harts, and as fibered an assortment of tools as the owner's mean will peptilt. An front vies, a bench drill, a fonce of power slight for metal work, and an emery wheel are among measure. Falling these, certain parts can be east to file along for refuting A complete bit of beach wreachs, nerword-trees, cotter pin extractor, etc.; also a nodelsing terch. They get slop after walking the of logand in a di more period of the control of the conposition of the control of the conposition of the control of the more period of the control of

a Theory of the coar he district that the coar he distrip it of legislar mid a gundel, old analytic file of legislar mid a gundel, old analytic file of legislar mid a gundel, old analytic file of legislar mid file of le

Ascertain by looking under neath whether the gasoline tank is attached to the body or to the

the department of the change of the change. If the form er, disconnect the gradient production of the change of th

The numbers is advised to begin overhauling in the order of ease rather than of magnitude. For this reason the brakes are one or this reason the brakes are one with side of this are specially exposed by table of the side o

Remove the radiator, wash it out under a strong stream of water, and if it is suspected of being acreased with select fill it appears that knows and let it stand—soult spram then will do no harm. When re-sembling, it can be supported to the standard of t

I and I, abow how a frame may be racked in going over a rough read of the radiator leaks it is best to set an apper thimmthe repair it (not all timestitia are expert). The severe of success is to use a good table of the severe of success in the s

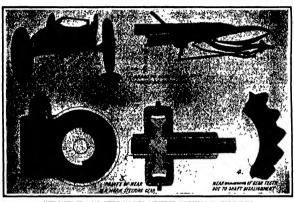
reducing gear of the steering mechanism disconnect the steering links also the throttle and spark con

nections, and take the steering column out with the theoring column out with the reducing spar at its base. Open the casing and see where the tout name to be the casing and see where the tout name to be in the investe of the segment B Much of it, how worm A Fig 3, and the teeth of the segment B Much of it, how worm, as likely to be in the thrust the secreting column and D of the segment B Much of it, how he will be a secreting of uname and D of the segment B between Federal Prequestions and the column section was been repeated to the secreting for case is not provided in the secreting for case is not provided to time to put one the work of the secreting for case is not provided below time to put one the work was and the secreting for case in the secreting for case is not provided below the secreting for case in the secreting for case is not provided to the secreting for case in the secreting for case is not provided to the secreting for case in the secreting for case is not provided to the secreting for case in the secreting for case is not provided to the secreting for case in the secret

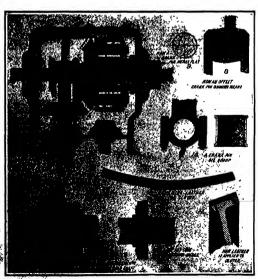
not easy to take up, an approximate cure is to make the bushings #C cecentric so that by turn ing them the centers of he worm and segment are brought closer together slinct, however, most of the wear is in the mid die toeth the gear may be loose in the middle uposition and tight when tha wheels are cramped over There is no runndy for this, save renewal

this, sieve relevant in the control of the photo in the photo in the photo in the photo in the control of the photo in the photo in the photo in the photo in the photo and fill in owe case-hardened pina. See that lee front where are parallel or 'toe in' very sightly when pointing about it is assual to shape the stoering knuckles so that the wheels incline or the photo in the phot

blackmith straighten it Cleaco out over case and test all the husbings in cluding the pitol bashings at the Front end of the squared shaft by shaking them IT bash or Police than It losses, if that in bashings they must be refitted or replaced New bushings bought from stork gamerally need considerable fitting. The rea-(Continued on page 83.)

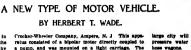


SOME PARTS OF A CAR WHICH MUST BE CAREFULLY CONSIDERED IN OVEREAULING



NOW PARTS WHAR IN AN AVROMOBILS.

AUTOMOBILE FIRE ENGINES.



The great success of automobile fire apparatus in The great success of automobile fire apparatus in Europe and in many of the smaller cities of the United States frequently gives rise to the inquiry, why are such markines and used more extensively in the lerger fire departments where the highest efficiency of apparatus and presented is demanded and main-tained. The acknowledged untilly of automobiles for pleasure and business away under extraordinary con particularly as the modern motor vehicle le now canable not only of attaining high speed but of carrying heavy loads. Promptness in reaching a fire with suitapparatus is of prime importar able apparatus is of prime importance, and the auto-mobile in this respect and in endurance is easily appertor to a horse. To-day with high speeds pumping capacity can be secured in a motor vehicle sufficient for most conditions of service, and this, with seconomy ance after the initial cost, has be adoption of automobile fire apparatus by many of the progressive smaller cities. This economy is obviously due to the fact that only when in operation are gaseline and oil required. A horse even when idle entails expense for shoeing and feeding

Even the most conservative of metropoli tan fire officials realise that the rapid transcan nee one can be realise that the rapid trans-portation by horses and the subsequent op-eration at high pressure of a heavy steam pumping engine on wheels is more or less a nechankal anachronism in these days, when contral power stations have largely taken the place of the small isolated plant, and when small internal combustion motors using gasoline have been found economical convenient, and efficient. The pumping power of a five engine depends upon the weight that can be transported. As an internal-combustion motor connected with a pump would weigh much less than a steam engine and bolier and going to a fire would use the same angine for propulsion, it would follow that greater efficiency could be se-

cured Even auperior from the mechanical standpoint, but not as yet practically applied, would be the mount ing of an electric pump on a gasoline-driven motor car, using current derived from supply mains near scene of operation Chief Sinne of the New York Fire Department has developed such an idea which pos-sosses many obvious merits. He proposes to use elecseasce many obvious nicrits Ha proposes to use circuity-driven centrifugal pumps on motor vehicles capable of high speed and to obtain power from electric light elandards or other outlets which are at most every street corner and quite as well distributed ar hydrants. The same condition also prevails in many rural districts, where electric light and trolley lines are to be found on every main etreet. Suitable | lugs and conductors could be used for connections, and with the power derived from a central station the ble machinery would be reduced to a mini weight A similar idea, though not so elaborately de-veloped, was jut into operation more than twenty years ago by Dr S S Wheeler, now president of the

ratus consisted of a bipolar motor directly coupled to a pump, and was mounted on a light carriage. The gasoline motor car was not so highly developed at this time, for which reason the carriage was drawn by horses. A fire engine built on this plan was tried out on the Eric Canal at Behenctady it was finally brought to Ampere, and was destroyed in a fire which occurred there in 1895 Strange to say, this scheme, which would involve comparatively little outlay for a large city, has never been thoroughly and practically

At present, motor apparatus is most widely used in esturbs and small cities with wooden desilings, in other words, in communities where its high speed renders it possible to cover a much greater target by a single company, and where infrequent alarms reduce the expense of maintenance for below that ex-tailed for feeding and showing horses. For example, a St. Louis motor company recently made a run of nins miles to a country villa outside the city limits and ar-

MOTOR-DRIVER CHEMICAL REGISTS.

rived in time to save the honse This same company in a period of eighteen months responded to 1,000 free without a single failure, and in so doing traveled 2,250 miles in all conditions of weather, including mud, elect and anow. The economy of this company is apparent from the fact that its maintenance account for twelve months was \$481.31, including two accifor twetve months was \$483 31, including two acti-dents, which resulted in an expense of \$250, as com-pared with an annual cost of \$816, for feeding and showing two horses. Even in a district where there are no water supply hydrants, such a machine can make a speedy run, and draw water from a well canal,

in a large city the question of territory is not as important as that of speed in getting the firemen to the fire in a district with high pressure fire protection fires occur which taken in time may not require the powerful etreams from the fire bydrants and could be put out with a minimum of water damage. Indeed it seems likely that the future fire protection of a large city will consist simply of an efficient high-pressure water system and automobile engines and ose wagons.
In a description of modern automobile fire app

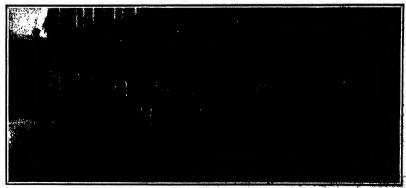
JANDANA THE TOTAL

we may mention, first, the high-speed touring ear or runabout, for the use of chiefs and supervising off-cials, capable of rapid travel and of covering wide spetions of territory This was the first automobile use by fire departments. Buch a car does not usually-easy inguishers or any fire apparatus, one or extinguishers and assess their tools are a superson, we to be a superson of their tools are a superson of the extinguishers and axes or other tools be

that supplied to the battation obigs, or the head of the fire department of the smaller city Extingulahers and tools are of the con-sidered essential. The chief carries with him not only a chaufeur but one or two firenim not only a reagger but one or two errors men from the permanent headquarties force. If rapid travel is desirable for the chief, it is of course equally advantageous for the fremen reagending to an alarm. In small blazes such as those caused by a curtain blazes such as those caused by a curtain blazes such as those caused by a curtain blowing against an open gas light or, by a short-circuit of a lighting system, one or two men with axes and hooks promptly on the scene can prevent what might be a furtious scene can prevent what might be a 'agripus fire in a dwelling house or stable. Aspord-ingly it was early realised that auxiliary or emergency squads could be equipped with motor cars and could be dispatched at high speed to the scens of the fire. These men deal with an incipient fire or prepare for the

deal with an incipient are of prepare nor used is seem engines which follow and if necessary seed is additional alarms or communicate by telephone with beadquarters. This type of equipment is extensively used throughout the United States.

But it must be realized that this means simply the prompt bringing to the scens of action the trained men who can take care of the smallest kind of a fire done where the blaze is at all serious. It was with this end in view that automobile fire-fighting facilities were increased by adding a chemical tank and a few ware increased by adding a chemical tank and a five hundred feet of email hose The chemical tank and equipment has now become an indepensable feature or many five departments. Carried on bore-drawn hose wagon, a small fire can be quesched in it al-cipleacy by its means with a minimum use of water and consequent damage. The chemical tank consists of a copper citerion of from 40 to 10 galious capacity containing bleatworstee of sods and other chemicals with which equipment can be designed to the con-with which equipment can be designed to the con-with which equipment can be designed to the con-tent of the contract of the contract of the con-tent of the contract of the contract of the con-tent of the contract of the contract of the con-tent of the contract of the contract of the con-tent of the con-tent of the contract of the con-tent of the con-t



A HOOK AND LANDIN ANTONOMICK TREES.

JANUARY 15, 1910.

sentiant to preserve carbonle-seld gas at such pressure so to be fortest with the witter through a small hose used with considerable success in some fire departments, but it is fair to say has been used with considerable success in some fire departments, but it is fair to say has been knowed or front unavariable in others. Expension of the considerable in the considerable of the considerable in the cons

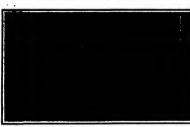
Scientific American

the wagon being reserved for larger fire-sagtise hose. Inti in a property designed automobile such apparatus can be sped to the some of a fire with four to additionen at from 60 to 50 miles an hour. Thus for a fire in a small substrated aveiling, in the majority or cases, as the contract of the contra

that such chemical engines be supplied in the ma-jority of fire departments to answer at once on the first alarm

first alarm

The next step in the progress of the small motor chemical engine was to make it larger and to add to tile squipment. Accordingly combination engines were designed which not only carried the chemical equipment but also bose for the following steam engine, scaling indders, tools and other apparatus, thus en scaling isaders, tools and other apparatus, thus en abling the men to prepare the way for more serious operations and saving valuable time. In this field a number of very efficient types have been evolved. Next in mechanical development comes the motor (Continued on page 69)





A NEW YORK AUTOMOBILE HIGH-PRESSURE SERVICE WASON.

PIRE CHIEF'S AUTOMOBILE



A COMBINATION TRUCK FOR SMALL COMMUNITIES.



MOTOR-FIRE PUMP AT WORK



A COMPLETE APPRICABLE PIRE DEPARTMENT.

AUTOMOBILE NOVELTIES.

SOME INTERESTING DEVICES FOR THE SEASON OF 1910.

A HEAVY TRUCK WITH FOUR WHERL DRIVE

The adoption of trucks in rural districts is a diffi tuit though very important problem of the automobile industry Bad roads and sandy soil create a number

the corrugated segments are dispensed with, and a replaced by a smooth strip of hard bream. This pike nel has no connection with the spring wheel propert. The general design of this inner section issay of comprehensively garbered from a reference to the With a single trailer gradients of 7 to 8 per cent can be negotiated at a speed of 5% miles so that the our seems well suited for making its way with the trailers also through deep sand



TRACTOR TRUCK (60-HORSE POWER 6-CYLIFDER) RAULING A TRAILER

THE SO-HORSE-POWER MOTOR OF THE POUR-WHERE DRIVE WEREN

of difficulties which can be overcome only by special construction

One of the most important points seems to be the utilization of all four wheels for driving thus increasutilization of all four wheels for driving thus increas-ing the adhesion. This is especially imperative in the case of heavy motor cars employed as tractors for load traits consisting of two or three vehicles where a weight of several tons acting on the fore axic can be utilized for adhesion. The Delimier Motor Works of Germany have con

structed for a well known Berlin export firm a heavy truck with four wheel drive which is being shipped to South Africa in order there to take up its heavy duties in propelling as tractor a train of 10 to 15 tons. This car shows a number of technical features

The chassis is made of compressed sheet steel gir The chassis is made of compressed sheet stees graders with compressed transverse beams and interestableds. The six cylinder applosion motor located in a three point suspension picks 60 horse power at the brake with 90 R P M. This motor is of the familiar. Daimler type with magneto-electric ignition

The maximum speed of the car is 10 miles per hour The low minimum speed 1/4 mile an hour is remark able thus fully utilizing the advantage of four wheel drive for the overcoming of gradients and traveling over sandy soil without increasing the dimensions of the gear case As only the for, wheels are sterable the rear wheels are driven through a toothid wheel

The rast steet wheels have broad rim flanges which are briended to prevent the vehicle from penetrating too deeply into the sand. The solid rubber tires are pressed immediately on the wheels. The fore wheels pressed immediately on the wheels. The fore wheels are steered essentially in the same manner as other care through wran gearing. The vehicle is equipped with four brakes operated independently of one an other via a graring brake two differential brakes and one rear wheel lrake. The motor car which is design ed for a useful load of f tons is able to haul two trailers of the same capacity while negotiating grad-ients of about 15 per cent with this total load of 130 hundredweight at a speed of 1½ miles an hour is about 12 540 pounds of which about one-half falls on the fore axis so that about 6.270 pounds on the fore axis is utilized for adhesion

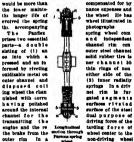
THE PARSONS SPRING MOTOR WHERL

The many well known defects of the pneumatic surface mobile tire have prompted many invenders to attampt to evoive an efficient and reliable substitute therefor without any arentice of resiliency. The general trend of inventive effort has been to secure this quality by some slaborate arrangement of springs without how over completely solving the problem Early in 180° however the Hon R Cleve Parsons M A M Inat! F directed his attention to this substitute of the state of The many well known defects of the pneumatic auto

what higher than the pneumatic such a difference would be more than compensated for by

parts—a double sisting of (1) an os into which a pressed and an in formed by riveting oxidizable metal on onter channel and disposed coli ing wheel the chan nished with corru having polished around the internal channel for the transmitting the onter channel and engine and the re the brake from the

In .



Parsons so

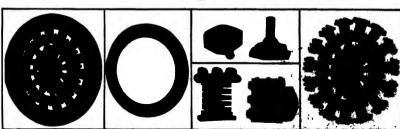
justration showing the wheel center of comprises an ordinary wooden-spoked wheel of small diameter having a groove around its circumference on each sids of which is shrunk a steel band or tire on each side of which is shrunk a steel band or time in such a manner that a groom of space is left to re-ceive the heads of the Theits by which the agent springs are secured to the rim of the wheel washer. These spiral springs are of the ordinary opinerisal type so colled as to fit that Auminium castige at ather and and with such spaces between the softs at there and and with such spaces between the softs that when compressed the state in not overstpathed. for protection against rust the springs are she dised and moreover each and is thoroughly the for a length of about half a cell

for a length of about haif a coil.

The alumhium castings by which the springs are attached to the wheel conter are of special design. On one face they have a spiral tunnel or thread, so that the spring may easily server into them, and are also provided with suitable lugs in order that they may be gripped by the Thoits A steal table as also rank 1000 the atumintum base which projects as the reat 1000 the atumintum base which projects

they may so graphe by the Toots A state take as a who was titted the attention base which projects are also as a state of the state of rubber pad vulcanised to a steel plate which is athed to the aluminium cap

The springs are inserted into the spiral tunnels at



THE COMPLETE WHEEL ASSESSED. WITE ALL ITS SPRINGS.

THE STREET RISE AND TREAD BASE MEMBERS TO WHICH SPRINGS AND OF THE STREET WHEN, ATTACHED, SPRING RASE AND OLD ASSESSMENT.

THE PERSON W. IL WITH COURSE RES

IAMUANY 15, 1910.

oir respective ends, and after correct adjustment are also to a certain temperature, insufficient to in re their temper, and meted solder is then run in high unites with the tixaing on the spring and sepublices the base and spring together in such we as to preclude any possibility of their bu-

a manner as to preclude any possibility of their be-coming locense.

The lower springs, i. e, those just above the point
The lower springs, i. e, those just above the point
of the wheels tread, are compressed under the wright
of the valide while those at the top do not touch
the circumstreams. The spring portion is therefore
precludily floating, for at no part is there any right
consistent between the prince and outer perior of the
wheel When the while is in motion the spring and
when the while is in motion the spring and
when the while is in motion the springs
there of the whele and are brought tignity in continct
with the rim but do not shift their position visitively
thereto As the wheel moves forward the springs
become disengaged and move round like the spokes
of a rigid wheel their places immediately being taken
by others The disengaged aprings travel forward
relatively to the rim in the direction in which the
valide is moving. The result is that the central
portion of the wheel makes a slightly greater und
portion of the wheel makes a slightly greater und
portion of the wheel makes a slightly greater und
profine of the wheel makes a slightly greater und
profine of the wheel makes a slightly greater und
portion of the wheel makes a slightly greater und
portion of the same time however it is impossible
for the inner part to traval round independently of
the outer rim or tread of the wheel atthock it is all for the inner part to travel round independently of the outer rim or treed of the wheel since it is all ways tightly in contact therewith at the point of the wheel's contact with the ground which is the point of application of the vehicles weight the rubber strips of application of the wallcies weight the rubber strips of the outer scientistics of the surprise restablishing such adhesion upon the surface of the interior of the rule at the present dury possibility of slipping and the surface of the surface of the surface of the centact surfaces. In the case of the driving wheel the gripping power of the spring members is every considerably augmented by having the corrugated sur-face as already described.

where a creary described.

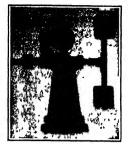
The successive compression of the springs as the wheel revolves is quite continuous and is effected with the utnose smoothness as the spiral springs with their cape can be defected in every direction Sudden period or consustance assumb cover which even the period of the springs of the springs

It may be thought that the absence of rigid of nection between the inner and outer parts of the wheel may be disadvantageous but experience has quite conclusively demonstrated that no such draw quits conclusively demonstrated that no such draw back exists It is practically impossible for any slipping between the two parts to occur even when the valicle is badly driven There is no friction be-tween the rubbers in the free ends of the springs and twens the rubbers in the free ends or the aprings and the internal surface of the channel rim. The springs as it were walk round the inner circumference of the outer rim on a polished metallic surface and are successively loaded with their due proportion of the car weight during each revolution. The moment the successively loaded with their due proportion or the car weight during such revolution. The moment the weight is applied to any spring the latter cannot possibly move relatively to the rim until the weight is released. Consequently there is an entire ab source of friction and the rubber shoes in the spring

is released Consequently there is an entire absence of friction and the rubber shows in the spring cape will last as long as the wheel three Brean in against the last should be shown that the spring cape will last as long as the wheel three Brean in the glammed it is an insignificant item in renewal but no such coursence has yet been experienced though wheels have been driven for thousands of miles Even the entrance of dust or much has no destrointing effect input the two surfaces. The wheel has been servedly (nated upon a 25 destrointing effect input the two surfaces. The wheel has been servedly (nated upon a 25 destrointing effect input the two surfaces. The wheel has been servedly (nated upon a 25 destrointing effect in the properties of the spring of the collection of the spring of the



Scientific American



A PAR DYNAMORETER FOR PROTING MOTORS

reduced running expenses. It has been found that the cost per mile with the pneumatic averages about 198 cents as compared with 048 cent for the spring wheel—a difference in the latter a favor of 150 cents Moreover as the wheel itself is practically everlast Moreover as the wheel itself is practically everlant ing the renewal charges are limited to the solid rub-ber tire which costs much less than a preumatic of the same dimensions and the rubber case of the spring members. Occasionally as the result of a very severe concussion of joil a spring night break. This can be sailly and quirtly replaced on the road but as the defection of the apring is limited in every direction. by the central tube the stress to which the steel is subjected need be no greater than that in the side springs supporting the automobile Such an eventu allty is therefore remote Again with this wheel in



LAMBERT AUTOMOBILE BAILWAY OAR BUILT FOR HARRIMAN BRANCH ROADS

view of the ingenuity of its construction the ever existing danger of side slipping is reduced to a neg lightle quantity owing to the firstbility of the wheel

AF AUTOMOBILE CAR POR BAILWAYS

The accompanying illustration shows a special car ordered by N II Harriman before his death which is to be used on a private road running from a point on the Eric Railroad to the Harriman private residence

The car is a Lambert friction drive and was ordered e of ascertaining whether a gasoline ca for from 12 to 16 passengers could be utilized more economically than steam cars on branch roads on the Harriman lines Whether a car of this character will come into general use will depend upon the result of

AN AUTOMOBILE BUTTET TEMPER

A novel automobile tender has been devised G L Reeves Mounted in the body across th end is a three-burner gasoline stove connected with a one mallon masoline tank Next forward is a receptacle one gainer gasoline tank. Next forward is a receptacle in which is fitted a complete cooking outst seach article sesting and telescoping into the other. The outsit consists of two frying pans four boiling venuels of fee pot twenty serving plates three savre pans and eight soup time. To the left of the cooking outsit is a three-bin vegetable celler with tray lid for large cook in the contract of the cooking outsit is a three-bin vegetable celler with tray lid for large cook. ing spoons cake invoices carving forks etc. To the right is a galvanised iron lined refrigerator containing six emergint class sealors ice recentacle and large me

Immediately forward of the refrigerator and extendimmediately forward of the refrigerator and extending to the end of the bed is a seven gailo water cooler. To the left of the water cooler is a thirteen drawer cabbut intended for all grossery and cooking staples halves forks spoons ten towels, table covers, etc. In the little open court there is just room for two tolescoping dish pans to disappear. The accompanying picture aboving the kitchen open tablessets that the two covering life when opened out from two expectors severing tables. These tide are correctly only the contract of the

ered on the inside with padded ollolob, and on the outside with rainproof ducking. The meeting edge of once cover is provided with a parent leather flap and is held in place in inransit by two large strape which beared as the strape of the bardle security and make the trader rain and dust proof. A small brass hasp and lot is also furnished A meat little folling duling table is strapped to the in aide of one of these lids

An extra broiler a cooker for emergency a pocket ax and a camp lantern strapped to an outside bracker aplete the outfit

The refrigerator and water cooler are fitted with drain cocks. A rigid pair of folding legs is provided to support the end of the body when disconnected from the ente

The wheels have rubb are so accurately nested that the tender moves even at twenty to iwenty five nilles speed without noise and

at twenty to wenty no mints speed without some and takes corners perfectly. The tender weighs 476 pounds and the extra draft on the antomobile is searcely perceptible. It has been need in serving a great many roadald, dimors and its entire practicability for such service established be-

A VAN DANAMOMETER

The standard type of fan dynamometer chown in the accompanying photograph has been devised by Joseph Tracy It consists essentially of a metal standard carrying a bortrontal steed shaft in large ball bearings. One end of this shaft is connected with the otor under test by a universally jointed exten motor under test by a universally jointed extension shaft the other end carries an overhung two bladed fan as shown. On the dynamometer shaft a small pulley fitted to a bose on the rear of the universal joint is belied to a larger pulley on the special tacho meter which is mounted on top of the housing that

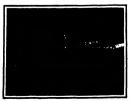
meter wate is monner on top of the noming ma-carries the dynamometr shaft.

The tachometer of the standard fan dynamometer is provided with a double scale and single pointer the inner scale showing the revolutions per minute and the outer scale the horse power diviloped. The neve lutions per minute scale is braduated progressively by divisions of 20 revolutions from 200 to 4000 r volu divisions of 20 revolutions from 200 to 2000 r volu-tions. The horse-power saie gives a minimum read-ing of 1 horse-power at 480 revolutions and a maxi-mum reading of 70 horse-power at 1980 revolutions Consequently at all ordinary rates of motor speed. simultaneous reading of revolutions per minute can be obtained without any computation

The standard fan dynamoun ter can be employed in testing motors on the block by making suitable con noction between the jointed jynamouncer shaft and the motor shaft cluth or flywhich if can also be used to test an automobile motor in position on the chassis by disconnecting the propeller shaft and sub-stituting for it the jointed shaft of the dynamometer

The standard dynamometer is designed to test me The standard dynamometer is designed to test mo tors of na dium sized cars. However by the use of fan blades of greater or its area and suitable tacho-moter saties the range of absorption and measure-ment of power can be varied between wide limits

The Tenth National Automobile Bhow in Madison Square Garden afforded a good opportunity of inspect ing the product of representative American makers the exhibition brought out some noveities in con-struction and design which showed a gratifying tend on union and designs which showed a gratifying tead they toward standardization. That the modern overy day motor (ar generally known as a stock (ar has left the misty rone of experiment and is now a practi cal and useful machine was strongly emphasized by the many performances in bilicilmhing touring and racing contests of 190). There is a comprihensive display at the Garden of duplicate models of the stock ousputy at the current of duplitate models of the stock cars that competed successfully in the various sport-ing events of the year. Some of the original cars are shown. Thanks to the adoption of certain standards a new model need no longer be put this only years ut testing before it is entered in competition with other cars Recently victories have been won by certain makes of cars that had scarcely competed in previous



THE BUTTER TREDER IN USE

ANTI JOY BIDS DEVICES.

ntinued from page 49)
saft connection with one of the vehiade by flexible shaft conne cla wheels.

5. Combination mechanisms, embracing switch and engine hood lock and vibration recorder

engine hood look and vibration recorder Some of these devices are now to all intents practi-cally obsolute and out of the market, and there never has been any general demand for any of them except those intended merely to prevent meddlesome persons

and mischlevous children from tampering with ma-chines left standing at the curh The one class of device that is in almost universal use is the lock ewitch vice that is in almost universal use is the loca which Almost every large manufacturer of ignition spark coils and ewitches offers a current switch with a removshie plug or lever or fitted with a lock and key by which the connection between the battery or man by which the connection between the battery or mag-nete and the engine earst pings can be broken and prevented from being re-established readily. The type of switches with removable ping is illus-trated in Fig. 1 Switches of this type are known as

trated in Fig. 1 Switches of this type are known as plug cutout ewitches and are now designed to be used with a dual system of ignition, so that either the bat tery or magneto cau be switched into use or the cur rent from either of two batteries turned on When the car is stopped, the metal plug, with insulated han die, which makes connection between the two termi-nals within the switch, as shown in the underside view, Fig 1, is withdrawn and the circuit is broken. Th Fig. 1, is withdrawn and the circuit is broken. The engine cannot then be restarted until the plug has been replaced or electrical connection has been re-established its some other way. The plug is small and cap be carried conveniently in the pocket. A modification of this type which precludes the pos-

A modification of this type which previousle has pos-sibility of inserting a nail or piece of wire as a sub-stitute for the plug is shown to Fig 2, in which the switch lever is removable. There are numerous makes of such switches. The end of the lever engages by a elot or keyway with a post that prevents it from drop-ping off and at the same time assists in forming an electrical connection. The other end of the lever, fitelectrical connection. The other wan of the level, is ted with a non-conducting composition handle, can be swang in an arc or complete circle to make contact with any desired contact button for use of batteries or magneto or to neutral "off" position

magneto or to neutral "off" position
A further development of the lock switch idea is
seen in the auto lock ping (Fig. 3) in which a Yale
clock is applied to a ping cut-out switch in such a way
sa positively to prevent the closing of the circuit
through the switch without the proper key or its dupitcuts. The lock is placed directly above the ping
cocket, thus prevention the insertion of a nail or wire soczet, thus preventing the insertion of a null or wire The cut-out ping is connected with the mechanism of the lock so that it is thrust in or out by the turning of the key. The key cannot be removed from the lock until the circuit is broken. Each lock requires a dif-ferent key, of which two duplicates are furnished to

The Vale lock, with allding plug connection to The Yale lock, with silding plug connection to take the place of the regainsr endout plug, can be fitted to various styles and makes of ewitches, being held on by acrews of a special kind that cannot be removed except with a double-pointed wrench made just to fit the recess in the acrew heads.

the recoss in the screw heads.

A device of somewhat eimilar characteristics to the foregoing is the break-circuit antolock (Fig 4), which is manufactured in different forms for use on electric and gasoline vehicles. The type illustrated is for elecand gasoline venicles. The type intustrated is for exe-tric machines, but the operation of the two styles is similar. When the switch bar, just above the barrel of the Yale tock, is pulled forward it breaks the circuit and remains locked in this position until one of the and remains locked in this position until one of the two kops furnished with the device is inserted and given a half turn, when the connection is re-estab-ished automatically by the ewitch har springing back into place. The electric vehicle lock is installed beneath the upholstering on the arm of the seat, whe only the face of the tock is exposed. It takes the pla of the ordinary cut-out plug, so that the operation of the lock is no additional bother

The break-circuit took for gasoline vehicles (Fig 5) de in dif rent siyles to apply to various sys is made in different sijies to apply to various systems of ignition. It is placed out the face of the cell position, taking the place of the unual switch. The switch-har is round and provided with a winged head, so that is can be rotated to make connection with battery or magneto or to "off" position at will. When it is provided in the magneto to a "off" position at will. When it is part of the research to track the arrow place for ward it breaks the circuit completely. It is not necessary, however, to turn the har or plug to much before tocking or unlocking the switch.

Another means of accomplishing the purpose of pre-whiting mediisonne persons from using a sar left standing in the effects of a grange in the Rochester evering wheel lock (Fig. 6) This is hinged so that the hars on the placed around the steering cold to the steering cold the steering cold to the steering cold the steering cold the steering cold to the steering cold the steering cold the steering cold the steering cold to the steering cold the steering cold the steering cold to the steering cold the steering c

steeling wassi lock (Fig. 6). This is hinged so that the hasp can be placed around the steering column. A steel pin at the back of the hasp enters a quarter-inch hole drilled through the outer and inner steering columna. When the hole in the inner column, to the top of which is hayed the steering hand wheel, has heen brought opposite that is the outer post and the piu of the lock has been inserted through both, the front wheels cannot be turned. The special feature of this device is the combination lock that renders unnecessary the use of a key, which may be mislaid, forgotten or lost. The barrel of the may be misistic, despotate or loat. The harrel of the lock constant stores tumblers one by the lock constant stores tumblers one the provided, with a small lag on either side which engages with the overposting large on the seat tumbler. Two tumblers are handead to an internal top cap but are free to reaste on its center pin, while the third tumbler is removable and lies in the hody or easing of the lock over a solid post that passes through its center All the tumblers have a large notch the the professor. All the tumblers have a large notch the the order is did and until all of the notches in the tumblers are brought into line, althoring the each of the hasp to pass. This can be done only by working the lock combination.

The lock can be operated in the dark, as the did is

can be done only by working the lock combination. The lock can be operated in the dark, as the dial is noticed so that by starting at 0—which is distinguished by a large or open noteh—the movement of the hand over the dial can be counted as the spring points drop successively into the serrations. When the lock is open, the combination can be changed in two minutes of desired Except for the stead plan, this lock is made entirely of hrones and is made in different clears to it feeting discount of different dimeters. The manufacturers have also preduced an adjustable happ steering columns lock made with four-tumber combination and operated by a key

In division B of group 2 is a new invention b out this season under the name Bongartz autol (Fig 8) The device le designed as a lock to prev (Fig 8) The device is designed as a lock to prevent use of the gear shift inver and, if desired, also of the hinkle lever. It consists of a simple lock incased in a reliable heavy brase case to be altached to the side of the car or the footboard directly behind the lever quadrant, and a rod with a head on one end and a recess in the other end to be engaged by the plunger of the lock With the guar-shift lever in neutral or in operative position, a hole of suitable size is drilled through the quadrant and shank of the lever to receive through the quadrant and shank of the lever to receive the rod. The lock case is then secured to the body or frame in such position that the hole for the end of the rod will be in alignment with the hole drilled through the quadrant. Now, when the car is stopped and the gears unmeshed, the rod can be inserted and ougaged in the lock, when it will be impossible for anyone not ing the key to start the machine

possessing the Rey to start the machina.

A notable advantage possessed by this device is that,
white preventing the car from being driven on the
road, it does not interfere in any way with its movement by hand in the garage or with the adjusting and
"tuning up" of the engine and its attachments by the chauffeur or workmen

chauffeur or workmen.
Not only is it essential that the unauthorized use of motor cars should be prevented but it is almost occupity desirable that some measure be taken to curb he speed enthusiasm of the hired chauffeur even when the owner is occupiting the tomosa or interior to the immossine or landaulet it is not altopather improbable that the owner needs a check on himself, as in the cellitarition of a good read, breeing atmosphere, and smoothly running car he may unwittingly let outhu-siasm overstep discretion. Numerous efforts have been made to produce something that would accomplish made to produce something that would accomplish such results by the sounding of audible signals when the car had attained to a certain speed or by the dis-play of a prominent speed indicating device that could be read at a distance by every passer-by. The objections to these devices, however, were so obvious that they never met with favor except on the part of persons never met with motorphobia and hwmakers eager for popularity among their constituents.

A practical device intended to accomplish the same

te in a much better and more effective way has been brought out recently for use in combination with n well known make of apsedometer This is the Jones automatic speed-control governor (Fig 9) The mechn well known make of apsedement. This is the Jones automatic speed-contrel governor (Fig. 9). The mechanism consists essentially of a speed indicator, an automatic cleral breaker, a controller switch, and automatic cleral breaker, a controller switch, and caterier switch, which has fire or more points of contact representing circuits, to persuited by the sciling of the contringal governor of the speed indicator. These writch is so arranged that when the indication. These writch is so arranged that when the indicator. These writch will cook the circuit through the first contacts of the switch will cook the circuit through the first contacts of the switch will contact aftern mine an hour on the dail, the switch closes a circuit through the second contact, and so FF setting the positer at any furure on the dail of the controller switch, the circuit cate through the corresponding contact only and at the indicated speed When this circuit is closed, it actuates the curvate to the printary of the indicator or spark coil, thereby critician of the spark from the stageto. Or it may be arranged to coperate the disc

or spark coil, thereby critifiag off the spark from the supine Or it may be arranged to operate the elec-trically controlled air valve or throttle, shattling off the supply of air or gas to the sciption and thereby pre-vanting the speed of the our from exceeding the in-dicated limit. As soon as the speed is regioned, the contact automatically critis det and the suggle sets its power again. Bloudle the spotter of the operatedling

switch he set at in intermediate position, as in illustration, the device will have no action whate on the speed of the car.

on the speed of the 68s.

As the controlling switch can be located abuser surwhere in the car, it is evident that the owner or any
compant of the rear heat can limit the speed as
desired, regardless of the driver. The device operates rity and is always on guard, giving a sense rity in passing through sections where the sp

security in passing through sections waste the speed regulations are rigidly enforced.

An example of the vehicle movement indicating is attument classified under A, group 4, is the watch-dog vibration register (Fig. 10); This operates on the principle of the pedometer, 4 pendicum or weighted arm being held normally in a horizontal position by light spring and caused to beat by reason of the comentum of the weight following every downward momentum of the weight following every downward and puward movement of the instrument. Beach-front of the pendulum releases a tooth in the train of gears which actuate the indicator hand and register figures on the dist. The dain is 3½ inches in diameter and is divided into 10 degrees. These divisions do not represent either hours or miles, but severe as a measure of the vibrations. Different cans occiliate vertentially in different periods, it has been found, but each machine occillates very nearly the same number of times for occlinates very nearly the same number of times for successive miles irrespective of its speed. Engine whrs-tions when the car is standing still do not affect the instrument, therefore the device makes no record ex-cept when the vehicle is in motion.

The instrument is intended to be attached perma-

The instrument is intended to be attached perma-nectly to the car so that it cannot be removed without the owner's knowledge and is securely sealed so that no one can tamper with the register. There is no shaft or wires connecting it with any working part of the automobile whose detachment or disconnection would render the recorder luoperative. The owner, would render the recorder inoperative. The ownship of potential of the instrument indicates say 10 points for each how to travel, will have no difficulty in determining from the reading of the dial how many hours his machine has been driven after he last had it out.

A different type of whelche movement indicator is

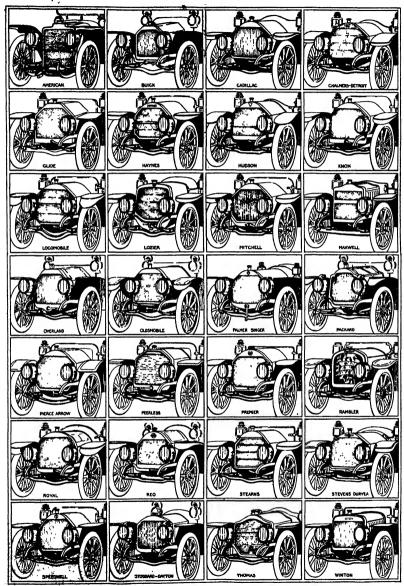
A different type of vehicle movement indicator is represented by the Bullard recorder (Fig. 7). This provides a permanent record on paper of the hours during which the vehicle was used, the rate at which it was run during overy mile traveled and the number It was run during every mise traveled and the number and duration of stops made. It operates by a combination of clockwork movement and fexible shaft drive from one of the road wheels. The clock mechanism rotates a circular paper dial that makes one complet revolution every hour in the same direction as the hands of a clock. The dial is divided into sixty radial spaces representing minutes, every fifth line being heavier than the intermediate lines for convenience in heavier than the intermediate lines for convenience in reading From center to circumference there are twelve circular divisions, also corresponding to the hours. Within the instrument is a stylus operated by both the clock and movement of the car, which makes a perforation in the paper dist for each quarter mile traveled, every fourth perforation being deeper than the others to indicate the completed mile The stylus is at the extreme outside space when the instrument is set for a record and moves toward the center at the rate of one space each hour, being moved by the clock and requiring twelve hours to more across the dial, where it becomes inoperative until reset. So long as the oar stands idle the dial rotates with-

so long as the our stands lide the dial rotates with-out being punctured by the stytes, but for every quar-ter mile the car travels if a piesaure vehicle) one perforation is made. And according as the machine is driven fast or slow the holes are close together or farther part. At the rate of a mile in four minutes, or farther part. At the rate of a mile in four minutes, or fitness miles an hour, there will be just one hole for each radial division, while at sixty miles an hour there would be four By examination of the dial it is po-ssible to determine the exact hour and minute at which he car was started and stopped. Combined with the instrument is a tiny ofcensive which registers the total milesga up to 10,000. The instrument depends for operation on a simple train of gears and ordinary clockwork and the same connection with the red wheels as every speed indicator. The investor decided upon the perforesting system because it cannot be tampered with without detection, no jar or joit of the or can decease; it and cold weather or dry counter. tampered with without detection, no jar or joil or use car can desumpe it and cold weather or dry cannot render it inoperative. For use on commercial vehicles, which move at a slower rate of speed, the stylus is made to perforate for every gighth mile instead of

wanted to perform for every gapua-every quarter.

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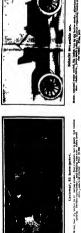
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Other you have wendowd what note of our was that which spot past your oyes or around a curve. Although most automobiles are more or loss alike in gauging apparation, they differ in curious features. The radiator and output bounds are manuage those. With the help of this chart, the cure here presented on the total chart by their radiators and output on sent and on the total the part of the plant of the part of the presented.

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8



MAKING YOUR OWN REPAIRS.

BY ROGER B. WHITMAN.



ho is familiar with the methods employed in the average automobile repair shop it is not sur prising that where of cars contiain of the size of the trincipal charge is usually for lab at so mu h an hour but there is no way in which at so much an hour but there is no way in white the own r can assure himself that pair of the time charged for was not wasted. The difficulty of check ing a labor charge is an inducement to a mild form of swindling and it must be admitted that there are shops in which an hours work by an untrained boy is charged for at the rate for skilled labor. Inco as the may be wated uniformly in 1 like again line may be wated uniformloadly I is not unusual to find that after assembling an engine of a gearst the work must be undone in order to fit an overlooked part or to correct on adjustment that about how been attended to in the first place and in such an event the total time occupied is usually charged to the owner of the car

chargest to the owner of the car When the prespective purchaser of an automobile, is of a properly inquiring turn of mind be will ask his friends to let him see their bills for repairs and maintenance and will probably gain the impression their entomobiling is an expansive diversion if he has any mechanical ability however he will realize that three-quarters of the work charged for could have been done with simple tools and an ordinary knowledge of

Aside from the economy of it the owner who does his own work becomes so familiar with the mechanism that it is instinctive with him to recognize the signe of coming trouble lie corrects faults at their in ception and by so doing be obviates an otherwise

inevitable delay and expense

The following notes are offered as suggestions to
the owner who desires to render himself independent

VALLE GRINDING

At more or less frequent intervals the valves of a soline engine and particularly the exhaust valves gasoline engine and partitularly the exhaut valves will become roughness and pilitude. When they are in this condition they cannot be expected to retain the compressed sease and to consequence the engine can not deliver its full power. It then becomes necessary and the valves which has a complished by in toducing an abrasive between the valve and its seat and rolating the valves which their pressure until the surfaces are were amonth. This is usually considered to be a feet for a repair man thus as it is patients rather than skill that is required the car owner need not healtast to undertake it.

rather than skill that is required the car owner need not hesitate to undertake it. Before grinding can begin the valve must be ru-lered from the pressure of its spring in many ex-gines in valve, seat and spring are contacted in a case that is ceally removed and the detacted of the apring from the stem is an easy matter. When the valve seat is integral.

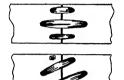
with the cylinder the spring hay be compressed by means of a special tool or by a flat metal bar used as e lev r 10 prevent the valve front mov-ing a small block of wood may be placed between the valve disk and the valve cap When the spring is com-pressed the device through which it acts on the valve strm may be removed the valve may then be taken out through the valve cap open

When a valve is in bad condition the surfaces of the disk and seat are rough and pitted. It is not necessary to continue the grinding process until the entire width of the surfaces is smooth for a harrower ting of bilt is sufficient to retain the paves if it is emiliacous and unin

terrupted Fintly powdered entry mixed with ma chine oil is a satisfact; abtasive but whatever is came on its a santaer(s) submisse our waterer is used great care must be taken to keep it out of the cylinder and away from the bearing surfaces. The passage between the valve packet and nylinder about it lightly plugged with colon pasts a string tied to ir () illitating its removal when the work is completed her a hadiy worn valve the first grinding is dos with course emery which is later replaced by a fine

LINING UP THE WE

grade to give the requisite smoothness. To apply the abrasive dip the finger tip in machine oil and then it day energy the small quantity that address being applied to the vairs surface. The vaive is then re-placed on its aext and rotated by means of a serse driver. A bit brace or breast drift may be used but consider the control of the control of the control of the conexcellent results may be obtained by means of an 8 inch or 12 inch a rewdriver with a round grooved bandle which is held between the extended palms. A con



tinuous rotary motion in one direction will tend to wear the valve oval and it is necessary to turn it first in one direction and then equally in the other A slight back and forth motion of the hands will give this result and as only a light pressure is neces

it should not prove tiresome In order to preserve the true circular form of the In order to preserve the true strustar form of the valve and scat the valve should be lifted after twenty or thirty turns and replaced on its seat in a new po-sition. To facilitate this a refe turns of a belical spining may be placed in the valve pucket under the dark its size and strength being such that the valve will be alightly litted from its seat when pressure is classed of the actual view of the location of the spring takes of the actual view of the location of the spring

is shown in the diagram. When the valve surfaces appear smooth all traces of the emery should be washed away with gasoline can bring takes that it does not todge in the visited vaire stem and push rod galdes or other bearing parts. To lest the fit make peerl marks on the valve sees and give the vairt a turn or two with the emerginative if the fit is correct the marks will be exceedingly in the present of the second of the correct of the correct of the second of the correct of the cor is shown in the diagram

valve seal and give the valve a turn or two want the arreadviver if the fit is correct the marks will be erased

The replacing of the valve epring is greatly sim plified if it is compressed in a vise and bound in the compressed state by light iron or copper where passed through it lengthwaye. The apring may then be

to notice the exact position of a piece before he takes it off and in general is unobservant of the foresight that would go far to simplify the reassembling. If time is not an object, he will eventually get all the parts properly rebuilt but if he sapires to be a good an he must learn to be methodical in every

that he does
The first step in dismounting any part of an automobile is to ascertain what holds it in position what
other parts may have to be displaced in order to get
at it and what parts may be released by its removal To take off an inlet manifold for instance it nay first be necessary to remove the carburster which in turn will require the disconnection of the gasoline

to turn will require the disconnection of the gasoline byte and throttle control.

The plan of action having been determined work may begin it will greatly facilitate reassembling if nuts boils screws and other small parts are placed in boxes the parts belonging to the third type in one, inspection plate boils in another and no on. If these larts are laid influentimitatily on the engine and rare are laid influentimitatily on the engine and control or the second of the secon

moved so that there may be no error in returning them moved so that there may be no error in returning thems shem manufut curres are careful to mark all parts by listice or figure or with a prick puzzh and when this is the case the marks should be followed absolutely in the case of genera it is usual to make three puzzh marks at the point of meshing. To reassemble them correctly it is then necessary only to place the marked tools, of one gave the west the two marked techs of cold, of one gave between its two marked techs of

When taking off a cylinder the connecting rod should be blocked or supported Otherwise the weight of the piston will bring it sharply against the crank case which may suffer in consequence if the cylinders are to remain off for any length of time they should be plugged with cotton waste at all open ings and several thicknesses of paper should be tied

tings also be placed to the control of the control

avoided natil it is proven to be necessary Taper plus knys and unampeted set acress are frequently re sponsible and as they must be accurately replaced their location and direction should be noted and remembered it is poor policy to rush a plote of work and after a few experiences with com-pression water and gasetine leaks that could be avoided.

beaks that could be avoided by giving more time to the job in hand the metorist will hang in his shop the motto Go slow, go sure," and abide by it

LUBRICATING THE SPRING It is the practice am utomobile manufacturery automobile manufacturers fit grease cups to the sha les and eyes of the sprin and the user of a car is clined to take it for gran

THE S AN INVITED.

GRINDING A VALVE.

placed on the valve stem and the holding device at tached after which the wires are out.

ALMERICAN, ALMERICAN, When the average man finds it secondary to take any kind of a machine to pieces be in inclined to one-sider results rather than methods. He unserves all of the nuts and both that are to be seen, and see each coupse of he lays it down wherever thate is room by its regardless of order or profess. He is not likely but it regardless or offere or profess. He is not likely

COMPARES WITH THE COSTLIEST CARS AS A PERFECT SMALL DIAMOND WITH A LARGE ONE



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SPECIFICATIONS

SPECIFICA HUND

ENGINE—4 ylinder, 20 H. P., 3 % inch
bore, 3% inch stroke; L-head type;
water cooled offset crank shaft; fan
bladed fly wheel in front; Parsons white
bronze bearing; noiselesc can shaft.
TRANSMISSION—Selective aliding gears
in extension bolted to crank case; shifting without noise.
CUITCH—Multiple disc type; self-adjusting; enclosed in gear case; running in
oil.

oii.

REAR AXLE—Shaft drive; Hyatt roller
and New Departure bearings; shaft and
universal joint enclosed and lubricated
by oil from crank case through trans-

BRAKES—Two foot and two emergency (internal expanding) lined with Thermoid on rear hubs. on rear nuos.

[GNITION-Bosch high tension magneto, doing away with spark coll, batteries and connecting wires.

TRES-30 x 3 inches.

WHEEL BASE-86 inches.

SPRINGS Semi-elliptical front, patented cross spring rear.
EQUIPMENT—Two side and tail oil lamps, dragon horn, tools, repair kit, WEIGHT-1100 pounds regular equip-

A small diamond is relatively just as good and just as rureaute a large one. In the same sense the Hupmobile is precisely as fine as the largest, the best and the most expensive cars made. We make the companson because we want you to learn to associate the Hupmobile in your mind with the finest cars you learn to associate the Hupmobile in your mind with the finest cars you learn.

the in your mind with the linest cars you know.

The Hupmobile claims the right (and that right is conceded by discriminating owners) to travel side by side with the best products of motordom

water cooled; offse owners) to travel size by side with the bill confesses no delinquences, admits no life confesses no delinquences, admits no inferiorities; concades no edvantage are provided by wheel in five confesses no delinquences, admits no inferiorities; concades no edvantage are provided by the provided by t

oblim were driven through the biting winter weather and deep moons, from Detroit to New York for As an object lasees, three Hope the Grand Control Paless Steen

HUPP MOTOR CAR COMPANY

DETROIT, MICH.

Name Address

These things (which are literally true) will explain to you what perhaps, you had not understood before—with you have encountered in the year past so many enthusiastic partisans of the Hupmoble

Everylody, if you will slop to think back-ward a little bit, has seemed to say kind things about the Hupmobile. They have said these things about the Hupmobile because it is the newly good kind of a moderate sized car which we have just described

A year logo there were less than 100 Hupmobiles in commission.

Today 5,000 are being built, as rapidly as oxcellence of workmenship with the finest materials will permit of hurry—lo satisfy a demand which spraing up in incredible volcompleted.

Of course, you want to know all about a car which has been favored with the warmest approval ever extended by the American motor car.

American motor-buying public to any motor car which has been favored with the warmest approval ever extended by the American motor-buying public to any motor car for the properties of the p

which will stick light upon a condition so unprocedented as the Hupmobile has created And if you are wavening in your choice of a car, your desire to know is even stronger

side and tall oil trivial bring our not only the Hupmobile literature, picturing and describing the literature picturing and send the literature of the original picturing and send the literature of the literature of

Scientific American

AUTOMOBILE NOTES

AUTOPAOBILE NOTES.

Undoubtedly the weak points in the pneumatic tire whather it be that of a cycle or motor vehicle, are its cost of up-keep and ilability to puncture. It is clear that the direction in which improvements have been made is in the thickening of the tread, so as not only to render punctures less frequent, but also to give the tire a longer life, and thus save expense in some makes of tire, the increase in thickness of the tread makes of tire, the therease in thickness of the stread of the outer cover, and in others that of the inner tube, has been so great thet most of the resiliency has been lost, and the tire practically becomes a solid one. In order to restore the resiliency, it has been proposed to reduce the air pressure in the internal tube, but this the inner tube and the cover, which is in any case dif ficult to avoid altogether, but also produc fiat surface. In contact with the road, which adds considerably to the tractive resistance, especially when the surface of the road is soft. The sylle of traveling i stack pneumatic tires are known to all cycle rider of are carefully evolded by keeping them inflate with n sufficient air pressure. The air pressure which it is necessary to maintain in the inner tubes of the pneumatic tires of a heavy vehicle is not less than 10q pounds per square luch, and should the slightest defect occur which allows the air to escape, the tire is not only rendered useless to support the vehicle but is speedily damaged if the collapse is not quickly repaired

At the Tenth National Automobile Show in Madled At the Teath National Automobile Blow in Madlson Square Garden there will be the only complete motor cycle exhibit in New York in 1910 by the Motorcycle Manufacturers' Association An inspection of the new models on display there proves that the motorcycle not only is a pieasure vehicle for poor and rich alike ranging in price from \$100 for the small single-cylind machine to more than \$500 for the expensive four touring model de leze-but a utility vehicle General refinement seems to be the tendency as well General refinement seems to be the tendency for 1910 Many improvements have been made in spring forks as the result of hard road contests during the past year 50me of the machines appear with spring frames and longer wheel base, all of which make for the comfort of the rider As regards the appearance of the motorcycle better quality and more isating enamel as well as heavier plating seems to be the aim of the manufacturers. Handlebar control is practically universal, and magneto ignition will be more practically universal, and magnete (galiton will be more popular than ever, several of the makers kaving decided to make this type of Ignition standard equipment, instead of optional as heretoforn linerased power apparently is a genoral tendency, and mechan lead olions are also in evidence, which climitate guesswork in tubrication, one of the bugbears of riding several of the manufacturers have decided to abolish the muffer report which, with the muffer improvement noticeable, should make the motorcycle of 100 as allout a size of as its forcument, the bicycle.

The Chalcace Detection have models will be manu-

Two Ofbianer-Detroit chassis models will be mann factured in 1910, the "Thirty" and the "Forty," both a continuation of those presented for 1909 The clanges, while important, are not in any case radional The new Chaimors-Detroit "Thirty" will have a 115inch wheel hase, three inches ionger than the 1909 Forty It will have 34-inch wheels—two inches

The Teath National Antomobile Show in Madison Square Garden eclipses any former exhibition of motor cars, motorcycies, and accessories over held in the famous building There is a total of \$23 different the famous building There is a total of 333 different display, or which there are 3 exhibits of complete care besides 240 exhibits of accessories and parts, and 71 monterprice oxibits is free with an increase over last year of more than 7000 fews with an increase over last year of more than 7000 fews with an increase over last year of more than 7000 fews with a successive which the show managers by impestious methods were able to eke out of the Garden interfor, there is not one foot of unared space a validate for oxibilities purposes. This actuation is indeed a striking commentation of the striking of the striking of the striking commentation. at the first entomobile show in this country, in 1900, there were only 60 exhibitors who displayed their product in the Garden

Noteworthy among the runabouts costing much less than \$1,000 is the liupmobile made by the Hupp Motor Car t'oupany Detroit Mich in its construcskors have endeavored to impart to the runabout all the staum bness excellent workmanship, and trustworthiness of the seven passenger touring car The four-cylinder engine is of 20 horse-power, car The rout-tylinder engine is of 21 norse-power, with four cylinders having a stroke of 3% inches and a bore of 3½ inches. Water cooling is employed. The transmission is of the selective alking goar type. The multiple disk clutch runs in oil. The regar axis is shaft driven. There are two foot brakes and two emergency brakes. A Boach high-tension magneto is

provided. Romething new in the Garden show is to be found in nearly avery one of the models exhibited. Some of the new point of interest are found in a nice and the new point of interest are found in a nice at transmissions, and in lubricating greens. In bodies, as type that seems to be gaining favor is the one passenger surrey, which is but a tonneau without doorn, built low in the back and idea, yet provide plently of seating space. The care at the Garden show range from the condition of the market down to that the runshout that is cheap enough for anyone.

tle runshout that is cheap enough for anyone.

Ja 1901, Mr Byron J Carter, then of Jackson,
Mich, realising the shortcomings of geared trans-missions as used in automobiles, began experiments
for improvements, being naturally attracted to the riction system because of its manifest advantages.

After months of careful research, the first Carterur After months of careful research, the first Carcerus ricidend-driven automobile appeared in the anumer of 1903. This automobile was of the runshout type, and in addition to the radical improvement in transmission parts, was well designed and constructed. The car has run more than \$5,000 mites, and is now, with out repairs, apparently in condition for additi pervice

A remarkable car has been brought out by the Schacht Manufacturing Company, of Cleveland, Ohio The car in question is ingratioualy convertible Or-dinarily it is a runabout. By the addition of a surrey seat the runabout is transformed into a four-passenger family car. The same runabout, by the smployment of a special box back, is converted into a tight delivery The vehicle is illustrated on the double page of cars appearing in this issue.

The present four-cylinder Cartorcar may be regard The present four-cylinder Cartorcar may be regarded as an improvement of the former two-cylindor model, without a single radical change. This car will appear in the coming season in two sizes. Both have the Carter friction transmission, the nucleus around which the first Cartercar was built

The most grueling sort of endurance contest in which motor cars have participated are 24 hour races As a rule ont of about fifteen cars starting in these events only five of thom finish at all, the remainder events only five of those finish at all, the remainder breaking down in the occurse of the content from some mechanical weakness. Bomo cars have started in eight or more of these terrific grinds and have never finished once At the 24 hour race bedf at the A Y P Expedition at Seattle, a Hudson "Twenty" electic car weight around the course for hours at a time making mile after mile with the turnout consistency in a 1 15 clip The construction of this car is interesting, when its low selling price is considered. The rear axis is its low selling price to considered. The rear axis is of the semi floating type, shaft driven, and is strongly reliaforced at the points where the greatest shocks and strains occur. Two large double-acting brakes are ed at each end of the rear axis built for the man who is satisfied with a speed of 55 miles an hour The motor, fonr-cylinder vertical, water cooled, is simple, very strong, and amply powerful The transmission is the three-speed sliding gear selective type used on all standard cars.

official Meteorological Summary, New York, N. Y., December, 1909.

Atmospheric pressure Highest, 80 49, iowest, 23 57, mean, 39 93 Temperature Highest, 54, dats, 6th, lowest, 6, dats, 80th, mean of warmest day, 45, date, 6th, coolest day, 115, date, 20th, mean of maximum on the month, 36 8, mean of minimum, 36 1, absolute mean, 31 **. normal, 34 1, deficiency compared with the mean of 39 years, 27 Warmest mean temperature of December, 42, in 1891, coolest mean, 25, in 1876. Ab-solute maximum and minimum of December for 39 years, 65 and —6. Average datiy excess eince January 1st, 0 7. Precipitation 5.00, greatest in 24 hours, 2 93, 1st, 07. Precipitation 0.00, greatest in 2s nours, eve. date, 18th, 14th, average for December for 39 years 343 Accumulated deficiency class January 1st, 287 Greatest precipitation, 686, in 1884, least, 995, in 1877 Prevailing directi a, west, Wind Prevailing direction, west, total movement, 11,944 miles, average hourly velocity, 161; maximum velocity, 168 miles per hour. Wenther Clear days, 14, partly cloudy, 8, cloudy, 9; on which 0,91 or more of precipitation occurred, 6 Sicet, 18th Snow-fall 114

Mazy an inventor has probably wondered whether the patent law forbids his experimenting with a pair-cated invention. The answer is It all depends upon the character of the experiment. Suppose that an inventor is interested in fring machines, and that his primary object to timprove the Wright machine. Hen he the privilege of holding a Wright machine is limited and fir-privilege of holding a Wright machine himself and firprivilege of miniming a wrught mechane anneath and my-ing it, in order to study time performance as well as to acquaint himself with the art of flying? We think not. He has no right to beside the machine for the purpose of bearaing how to fly or for studying its performance in any way. Had be bessed the machine-from the Wright brothers or their Recesses he would bredly have the right to use the machine in

Jamuan 16 tops

Institute the magnitude and institutes.

Institute in considerable detect, since in each contraint, seems to arrise in regards the 1929 regions to arrise in regards the 1929 regions town and Honesse in different Shides, the Bureau Tower of the Antoncobile Child of American has issue a chart showing past what States require registrating or Honesse for the new year, where yearwhat are necessary, and where the old registration or Honesse for the contraint. As reposed as this dataset we have year. operative. A synopole of this chart for New York, New Jersey, Pennsylvania, Massachusetta, Connecticut, she

Jersay, Pennsylvania, Massaccaserta, Connectert, asse Rhode Island is as follow: New York.—Registration of care in New York State are perpetual on the car originally registered. If car-changes ownership, the new owner must re-register same. If new our is purchased, atms must be regis-tered. Transfers are not made.

sams. If new car is perchased, stans must be registed. Transfers are not made.

New Jersey—Ragistration of or and driving lionace is equited samality and same on the register of the second of the se

certificates of good character and recommendations.

Connecticut—Registrations are annual, expiring D cember 31st Annual driving license required by owner or chauffeur Non-residents axempt for ten days from registration and driving licenses.

Rhode Island —Registration and driving license re nired Fees of registration based apon horse-power residents duly registered in home State are exmpt for ten days.

Riectron—A Mosal Lighter than Aluminians. According to Kosmos, a technical roviow appearing at Portshein, the Orienthe-Michectron works athibited at the aeronautic exposition at Frankfort-or-the-Main its novel patented alloy, the metal "electron," which is claimed to be much lighter than aluminium and at the same time much more darable.

The lightest metal employed for technical pu

up to the present time has been aluminium and som alloys of aluminium, the strength and the durabilit of which are however lower than those of the new metal. The density of aluminium and its alloys has metal The density or atuminium and its alloys ma-been nearly 8, and they are about twice as heavy as electron. The chemical works of Griesheim-Electron has discovered that magnesis is ntilizable for technical and discovered that magnesia is ntilizable for technical purposes. By the admixture of magnesia, the price of which is comparatively low, with one or two metals, an alloy is produced of a density of 175 to 3, possess-ing great solidity, strength, and elasticity, and at the same time readily workable. The color of these alloys reaembles that of allyss, and they possess great some esembles that of silver, and they posse ess great so rous quality

rous quality

The new metal is maid to behave vary well as regards change of temperature, and it responds to all technical requirements, in the air it becomes ceremed with a coating of projective oxide. As cast metal, it does a revisiance up to 18 thlogrammes per square millimeter and has at the same time an extension capacity up to 5 per comit. By the processes of concession, so the same time and the sam ounsation, soon as compression, rolling, etc., the physical properties of this metal, a.g., strength and elasticity, can be materially improved without its density being increased to any considerable extent. We may thus obtain a tensile resistance up to 35 kilo-

ty other increased to any combourable action. We present the property of the present of the pres

name oppose, one worse requires all socks by ger sear; so or electron than or aluminitum. The "Experimental requires 4,500 khigarangules of aluminitum, which origid be explained by 4,500 kilogrammen of aluminitum, which origid be explained by 4,500 kilogrammen grammen of alcotron. A large accountable contribute in mechanism, about 400 kilogrammen of selection, the which could be contained, the selection of the all of the anisotron, by 6th Engineering.

THE MOTOR CAR ARE THE BEAR.

(Continued from gage (7.) out binders tecinde the petro Springarshit binders' faccines the petro-fisure containing an asphalitic been, the presence of runh petroleums, the heavy strength of the petroleums, the heavy strength of the petroleum of the petroleum should be properations. In addition to these, as law special materials have been them, as law special materials have been them, as law special materials have been should be a super factories. In some heat one of the petroleum of the petroleum have been added to oil or tar emulsions to cause the residue upon the road supse the residue upon the road su face to harden after the volatile products have evaporated. Waste sulphite liquors nave evaporated. waste suppute inqueri-from wood pulp have been employed with some success in a concentrated form, and, in fact, the list might be indefinitely ex-tended. The essential requisite in a dust preventive is its binding power, and it naturally follows that the experiments will cover a wide field.

Water, while usually the most abundan and cheapest material, is very often, be-cause of the frequency with which it must cause of the frequency with which it must be applied, the most expensive to use. Its binding power is almost entirely due to capillarity. The value of the sait solutions commonly used lies in the hygro-scopic character of the dissolved sait, which, having counderable affinity for water, keeps the road surface in a moist condition long after a surface treated with water alone would have become dry through evaporation. The light oils and tars, as well as the oil and tar emulsions, are dependent for their effect upon the re-tention by the road surface of a comparatively small amount of true binding bas tively small amount of tree binding base after the volatile products have evapo-rated. This base proves effective only as long as it retains its binding power. When the binding power is destroyed, it is necessary to apply more material. If the base is an exceptionally good one, the accumulated products finally barden the road surface and prevent wear to some

The heavy oils and tars differ from the lighter products in that they contain lighter products in that they contain a much greater amount of asphaltum, which constitutes the binding base. The results are, therefore, of a more issuing characteristics were the second of the sec

natural or artificial The small method of applying these ma-terials to the road surface is hy aprink-ling. The temporary binders can unsulty be applied cold, but the permanent bind-ers, because of their much greater vis-cosity, must be heated nuitl sufficiently fluid in Engiand and France the use of num in England and France the use of coal tar is practised to a large extent and their methods of application have been highly developed. Machines are in gen eval use which are self-propelling and in which the tar is heated and then applied the road surface as a spray under high sours. These so-called "tar sprayers" pressure. These so-called "ar sprayers are not only very economical in the use of tar, but insure a more even distribution and better penetration of the road surface than it is possible to obtain in

imost any other way. In the construction almost any other way.

In the construction of dustians roads,
the crucial question in that of cost. Automobilies have but fittle destructive effect
on paraments, but these are in general
to costly from country reads. The effort
minst be to develop a form of construction
which will withstand has automobile
tresis and at the same then be within the financial resources of the community This is largely being done at present by the use of a bituminous binder instead of the rock dust. The two methods gene-ally employed are known as the superthe rook dust. The two methods guest-stly employed are known as the peactiv-tion and the strings method. In the for-sart, the bot liquid stonder is granitated or spectrum of the string method and allowed to appearage through the weeks stat once the strains smally to a depth of two or three mades. Stone of the devices in was from the blooker bits the root curries by means and the strains and the method of the strains. of heavy of pressure. In the mixing



"This Car Can Be Run 5,000 Miles a Year at an Average Total Cost of \$3.98 a week"

Here is a Big Touring Cur that will interest thousands of men who have always considered an automobile beyond their means-not because they couldn't afford to buy one, but because they have felt they couldn't afford the cost of maintaining one It is true that the expensive "up-keep" of most automobiles has put them beyond the reach of men with moderate incomes. . Not so with the Maxwell. Our cars have always been the most economical to run, as over 20,700 Maxwell owners have proved. Our constant aim has been to make automobiles that the mass of the people could afford to own We have kent right on from year to year improving Maxwells in every smallest detail that would reduce their operating expense-increasing strength and durability, decreasing weight, and simplifying construction

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BASED ON FACTS

BASED ON FACTS
When well up has the like light decloses below the contribution of the light decloses the contribution of the light decloses the li

CHEAPER THAN TROLLEYS

As these figures show, the average cost per week is lost ERR to run this big Marwell 100 miles, Than making the total runnings cost per ratile plant under four cents. Do you realize that this means that you can stake a family of the for an octiving in this car at less expense than you could take them by topical. You has few people for a trulley ride to the country of the country of the country of the twenty miles out of New York and back would could the provide the country of the country of the country of the truly miles out of New York and back would could twenty miles out of New York and back would out at least twenty cents each way, a total of \$8.00. Pive people can make a round trip in his big Manwell touring car at a total coot of \$10.00. Surprising as this statement secure it is true, and we have included it here to furnish you with a stifting reasurple of the practical advantages of our great "Monomov Cur".

WE HELP YOU

WE FILLY YOU

Froper cen's to fixth Importance to keeping down the cost of malatranase is any our. How control of the cost of malatranase is any our. How cost of malatranase is any our. How cost of the cost of

These Books Free Copy of the result of the district one in you a regy of our magnitus. "The Copy of the results is "The Copy of the results in the Results in the Copy of the Results in t qualled by any o

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Kingstand Point, M. Y.

method, the stones and hinder are thoroughly mixed, either by hand or machine, oughly mixed, either by hand or machine, no that each stone is covered with a thin ilm of the binder. This method in gen-eral insures the better and more even dis-tribution of the binder throughout the

The material used for the bitnder varies were largely with different socious in England and France the tare ere used wery largely. In the wester portion of the United States, the heavy asphatic old of Childrenia are need emet excite sively, while in other sections we find that tare, residence of the indica sphalfa, and various proprietary compounds are half or socious of the control of the con

One of the chief causes of the great number of failures which have been re-corded in the use of bitminous road ma-terials is the failure of the user, as well as manufacturer, to understand certain fundamental principles. To many, a tais simply a tar and oil an oil, while in reality there is a vasi difference some-times even in the tars produced at the same works. The oils size range from same works. The oils also range from those of a paradine base to these almost wholly asphattic. Thus a concise knowledge of the character of the product, the process followed in its preparation, and the effect which varying conditions will have upon it is nece avoid costly mistakes.

THE MIDDLE WEST AND THE AUTOMO-

(Continued from page 48) that the freight has usually been edded to the purchase price of the car, and has gone against the consumer, there are many cases in the past, and there will be many cases in the past, and there will be many more in future, where the cars are sold directly at the catalogue price. For that reason, the location of factories in the middle West was ideal, for it is in truth the center of the automobile-buying

In some cases, cities have been made over and their population doubled and trebled by big motor-car factories, as in the case of Filmt, Mich, and New Castle, Ind. Such cities have had a (remendous boom in real estate, and in husiness gen erally, owing to the influx of 2 000 to 5,000 families, and have assumed an entirely dis ferent position on the map because motor-car factories were established within their limits Besides supplying employment to laborers in large numbers, much money has been made by the leaders in the vari ous enterprises. This has been especially ous chterprises. This has been especially true among the makers of wheels tires, frames, and other parts in a general wey it may be said that the parts makers heve made more money than the automobile builders, as the latter have expended greater sums of money in experi-

The total capital of the automobile menufacturers in this country is about \$225,000,000 The actual value of the plants will run into some extraordinary figures, and these values are rapidly in creasing As for the output for 1910, it is likely to exceed 200,000 cars, although there may be a slight failing off from these figures, owing to the inability of parts makers to supply the demand or parts makers to supply the demand.

There are now about 150,000 automobiles in use in this country. In a general way, it may be said that the employees number some 120,000 fm motor or factories. it may be said that the employees num ber some 120,000 fm motor our factories with employees in parts factories reach ing not less than 40,000, a total of 160,000 ing not less than 40,000, a total of 160,000 America may be safely considered the home of the low-priced car, a condition brought about by the tremendous buying power of the middle classes, who denamd a car which can be cared for by the owner without the aid of an expensive chauffeer.

These to worked was have been made

These low priced cars have been made ible by ideal factory methods at production This necessitated their being standardized, something that may be said to be original with the American maker, to be original with the American maker, who feels that eny one of ten thousand parts should be made to fit eny one car turned out by bis company By working on big productions and

THE KNORS WILL STOP YOUR SKIDDING



MORGAN & WRIGHT NOBBY TREAD TIRE MORGAN & WRIGHT, DETROIT

BRANCHES, AGENCIES OR DEALERS EVERYWHERE

The limited power carried in one charge of the baltery has forced the designer of electric carriages to avoid as far as pos-sible all leases due to friction in the method of transmission of the power from

their noisy running, their rapid wear, sequipped who are their separate to dirt and dust, and portant that they abould stop the car ideoressod wugan who are some point for years as well as backward. It capacity and durability has been obvious for the superiority of the shart is a cer is a cer is a cer is a cer in a cer is a cer in a c their noisy running, their rapid wear, their exposure to dirt and dust, and

that the American maker will sooner or later figures in the foreign trade. This is personal particularly true in connection with the investment will not be represented by the foreign trade. This is personal particularly true in connection with the investment will not be represented by the foreign trade. This is personal particularly true in connection with the investment will be made and the seed of compressed rawhide A little less in a loss of efficiency which will, of course, shortent the maniful medium priced car, a field that has been assigned by the foreign rest with the rapid growth of the bear and the seed of compressed rawhide A little less in a loss of efficiency with the rapid growth of the same and the seed of compressed rawhide A little less in a loss of efficiency with the rapid growth of the bear and the way for motor-car trade, and who are certain to be important factors in future industrial life.

The Meddern Execute's Automatical for the true industrial life.

The Meddern Execute's Automatical for the true industrial life.

The Meddern Execute's Automatical for the particular transmission are additionable to pitch shift in self-adjustable to pitch shift of the very long and proved transmission was obtained when the construction to the correct at any time of the part of the starts of the construction of the correct and the self-adjustable to pitch shift of the search of the self-adjustable to pitch shift of the search of the self-adjustable to pitch shift of the search of the self-adjustable to pitch shift of the search of the self-adjustable to pitch shift of the search of the self-adjustable to pitch shift of the search of the self-adjustable to pitch shift of the search of the self-adjustable to pitch shift of the search of the self-adjustable to pitch shift of the search of the self-adjustable to pitch shift of the search of the self-adjustable to pitch shift of the search of the self-adjustable to pitch shift of the search of the self-adjustable to pitch shift of the search of the self-adju

silio al lieses due lo fréclios in 100 reseaux for the superformy out benthal faint de the hant is not hand is not not peed to a first than hand is not not peed to a construction a double reduction of a peed fails near that the motor shart or on the rear wheels, which is one construction and the hand is not require any adjust- (or the internal expanding brake at the hand is not the hand is not the hand is not the hand is not not peed to a counterwhat, not the hand is not ha

greess this bestring will not require any pheumatic three are that runt as well as attention to review at bounding. If oil is wery destinated to them, and that awe selected, no wear can be noticed Frey? electric carriage whould be equipped with reliable brakes. It is time the compared with the up-to-date belief portant that they should stop the car decreased weight with a large increase in



HOW TO OVERHAUL A CAR

NOW TO OVERRATE A CAR

(Continued from page 53)
son for this is that the shafts, especially ger shafts wear down and
must be ground true and no manu
matchners seem to appreciate the useful
ness of boring repair bushings slightly under size The plict husbing being solid be specially made to suit the chaft Aside from this one a skillful amate can meke e good job of acraping his own husbings if he has a suitable set of scrapers and time and patience. Hed lead is used to test the fit. Of course the gear case n ist come out of the car and at intervals the bushing caps are boited down tight and the shaft turned to de whether it is tight or free and whether it makes contact all over

In refitting gear shefts and bushings it is necessary not only to achieve a proper fit but to keep the shafts absointely parallel If they are not the

best result is naturally gained by replac-ing b th mating gears if either is badin ing h in mating sears if either in badly wors aim othersise the new years would have to run against a had profits and would west sway sooner if the car has aid casts drive the differential shart dustines will need refitting at the same time. The parts of a differential which wear feature are the husbings A of the sur or beval printed B (Fig. 8) since these are the hardest things to inbricate
To take the differential agant it may be necessary to file the ends of heeded over through boits holding it logether in that through boits holding it logother in that case the nuts should be reduced in thick came the nuts should be reduced in thick ness so that the boits can be headed over again on resasembling (The boits in Fig ' do not go through) It is very important not to give anything about the differential the slightest chance of work ing loose and the same applies to the boits holding the change gears. Another point that is difficult to oil and therefore liable to cut is the bearing (between tho differential or geer hub and the sleeve into which the hub of the differ ential shell extends. This sleeve runs in plain ur ball bearings in the case with the shaft or gear bub turning inside of it whenever the car goes around a turn Booner or later new hushings are

If oil is used in the gear case as it must be if piein husbings are used in steed of ball bearings it becomes something of a problem to inhrical, the hear ings effectively without excessive leak age of oil the writer solders a thin wire age of oil the witti solders a time wire games screen (Fig. 6) over the interior oil pockets to exclude steel grit worn from the gears. In order to prevent es-cape of oil from the ends of the bush ings e felt ring is necessary (Fig 6)
This ring would cause he oil near it to
become stagnant were it not for a special DOCUME SEARCH WE'VE IT NOT TO SPORTS.

OIL STOOM BY WHICH SHOULD BE ADDRESS.

WITH A STOOM OF BY WHICH OIL SHOPE OF THE CAMP.

But for this provision particles of dirt. tetting into the end of the bearing would accumulate and cut the shaft

In the rear axis of a shaft-driven car the thing most likely to need rejlacement is the differential there ere various ways of guiting at it depending on the design of the axio casing. If the axie is divid d verticely in the fore and aft cen-tral plane the rear springs must be jucked it and disconnected from the axis d th baives of the axle drawn as and it have, or the axio drawn assumers after taking off the wheels. A better or rangement is to have a removable cover plate on the asing through which the differential is instrict and withdrawn. This is found especially in exics of the This is round expectany in exist of the finaling type with wheels running on ball or roller bearings on the ends of the exist tubes and driven by floating shafts extending from the differential to jaw clutch plates ungaging the outer ends of the wheal habs. To remove the diff ferential the hub caps are first rem



\$680.00 Without rumble seal With 114 in

\$700,00 rumble ad 1% iach

\$730.00

\$750.00

OUR NEW 1910 titlety parallel. If they are not not not good received that the content of the c

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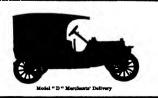
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Name.

Address City_



and the feating sh the straps holding down the

ferential needs overheating. By Jacquise up one rare wheal and rotting it black and forth, the total angenit of sized in and forth, the total angenit of sized in the differential may be epithemated. It is also usually possible to reach the platent through openings in the differential shell, and by shaking them to determine whether they are looss. If po, they should be revealed and the phas or spider replaced it were. Prospensity planes are placed in the property of the prop the gears should be moved in a straight line and not canted ground, also the teeth will engage only at their small or large ends instead of over their full length. By rubbing red lead on the teeth and turn ing the gears, one can tell where the teeth touch

if cup and cone ball bearings are used ir cup and come ball nearings are used whether in the rear axis or in the trans-mission any worn parts should be re-newed immediately Fig 7 shows the effect of wear on a stationary ball cone, effect of wear on a stationary ball cons. of g on an axia spatial the pressure comes against the stationary bottom portion and while the cup were a true path the cone is destroyed. It is possible though not always worth while to be though not always worth while to a quarter or half tern on the shaft or axie if the cup is stationary and the cone rotates evidently the cup will be first to wear out of round When one ball of a set is reserved the entire set should be replaced with it.

We come now to the engine the last and in some ways the most difficult part to overhaul The owner is strongly ad vised not to attempt to refit the main crank shaft bearings unless he has had considerable previous experience and erank shaft bearings unless he has had considerable previous experience and knows exactly what to do On the other hand it is not at all hard to regrind and readjust valives replace wern value illuser and the guides and to do or dinary tiskewing and adjusting with the limer arborrer of it is best not to tamper with the magneto turther than to clean the interruptor and adjust the

to clean the interrupter and adjust the interrupter coincide points if worn To overhaul the engine first strip it of all small gear Take off the magneto first marking the coupling so that it can be replaced exactly as it was and tag the wirrer Remove and tag the oil pipes, blow through them to see that they are clear and ping them to exclude dirt. Descenaet the carburster remove the Descensed the carburster remove the timer take out the spark pings and ping the holes with waste remove the dust pan take out and mark the valves take off the water pipes, the pump, and the fan Now take off the cylinders If no tan Now take on the cylinders if the further dismantling is contemplated the piston heads may be scraped as sits taking care that none of the earbon falls into the crank case and the piston rings are likewise cleaned without removal if illie If the rings are leaky as prov

the miles of the wrige are sense. It is a sense of the property of the propert oranz pm resur will in time were that at the point of greatest presenting, as indi-cated in Fig. 9. It takes more skills than can be dequired off-hand to time it up again, but it can be done with a fine

Swiss its and calipers. It is not neces-sary to file clear around the unworn por-tion of the pin, aloce a slight devia-tion from its original axis does no harm, neither is it absolutely essential that it should have the same diameter through out. Its new axis, however, must be ab-solutely parallel to the shaft. It is best to throw away worn bushings and put in new, taking out or inserting shims till a fit is obtained, and scraping no more than is necessary A worn wrist pin bushing must be renewed, and usually the possing must be renewed, and usually the wrist pin must be ground true. If the crank pins are olled through passages oranne pins are olled through passages drilled in the crank shoft, their lubrica-tion is probably perfect. If, however, they are olled solely by aplash and the oil holes are in the upper haif of the crank pin bushing, a considerable im-provement can be made by replacing the upper bushings with solid ones and in upper bushings with solid ones and in trodding the oil through the bottom half by brasing a copper tube in the cap to act as an oil ecoop (Fig 10). The bot-tom half is then drilled and provided with an oil grove for about half its length. It is a principle of inbrication that the oil should slaway be introduced at the unfoeded side of the journal and that any breaks in the continuity of the loaded surface merely afford the oil an avenue of escape under pressure To renew the clutch leather, take off

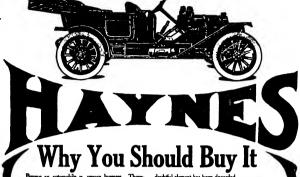
the old leather and use it as a pattern Select the new leather carefully for uni Select the how teather carrently for uni-form and correct thickness, and cut it about half an inch short. The curva-ture should be approximately that of the old piece (Fig. 11). Locate the end and the middle holes for the rivets countersinking them considerably so the rivel heads will not come flush, and soak the strip in water this it has swelled suf-ficiently to go in place. Use the end of a steel Bar sa an anvil, and put in the end and middle rivots first, holding the strip meanswhile hy wire nails. The riveting must be completed before the strip dries. The riveting

AUTOMOBILE PIRE-ENGINES.

(Continued from page 55)
fire engine proper After reaching the
seems of the fire the driving gear is uncoupled and the pumps are put in connection with the engines. Such fire ennection with the engines. Such fire engines of course must draw their water
from a hydrant, well, or other supply
They have done splendid work in au
burbs wherever fire engines of suitable
power or an adequate high-pressure system can be held in reserve Tho best
of those machines can run to a dre with

Comment of section and a supplementations. a crew of seven men at speeds up to 60 miles por hour and carry 1,000 feet of home. The pumps deliver 700 gallons of water per minute at pressures up to 150 pounds to the square inch. The regular steam fire angine has a capacity vary-ing from 400 gallons per minute to 1,000 gallons in the case of the largest size of machines. Such a motor fire engine usri-ally contains two 3-gallon chemical extinguishers, and heavy suction hose for hydrant connection, fire axes, nomic holders, large slarm bell, the usual equipment of lamps, lanterns, tools, and small scaling ladders. In the opinion of many fire engineers a suburban fire station should have two such motor engines,

fire engineers a suburban fire stations abould have two such motor engines, with possibly a steam engine may also be brid and an engine may also be brid animher of shage steamers. This means considerable excoming in the purchase, equipment, and maintenance of a fire house, whith the increased radius of action and the speed of the motors considerable extracted to be readed. Finally, we may consider machines in which no ensured the except to use the gastern and the state of the second of t



Bayma an astomobile is serious business. Thousands have desired themselves the pleasars of motoring. They doubted the windows of buying an expensive case and would not take the riak of a cheege one. Perhaps you're one of them.

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It costs money to build a car that will stand the test
year in and year out. There is bound to be skimping somewhere in a cheap car. That means not be successful to the sending to somewhere in a cheap car. That means to bould to be skimping somewhere in a cheap car. That means to bould in year soone or later, and dis-

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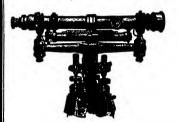
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re service Nor is lie use of the infoundable con like maters of motor for appleatus eximinated to the emerging way angon is hemical limited to the emerging way and the light are now made for motor traffic little the operation of commercial motor to the properties of th including the contraction of the contraction of the contraction of commercial modes in the contraction of th and have all the essential features of

roundorable efficiency
That the motor-propelled apparatus is
bound to come eventually and to supplient obile combination gasoline en I wa automobile combination gasoline sa-alines and hose wagons for the borough of Hruskity and one for the borough of Hruskity and one for the borough of Queens. At present the high editency notor five engines cost more than steam fire engines of greater power, and as five shahiting power is desired first of all, in nextly every large city department, the chiefs prefor heavy units to increase unbillity and speed. On the other hand mobility and speed On the other hand the makers of motor fire apparatus claim

vehicles that naturally arise in connec-tion with fire apparatus. One is, the matter of tires, but it must be recalled

ANTI JOY RIDE DEVICES.

AFTI OF RIDS BEVINES.
(COnsistence from poor the control of the car by means of attachments fractioned inside the hood Forexample by means of two thimbscrews through the control of t

tion institute to record movements at the control of the control o

hood These cables lead to two special spring latches secured to the lower inner corners of the dash in a position to en gage the alois cut in strips of angle from gage the mote cut in strips of angle from riveted to the inside of the hood on either side. Thus, when the key and cam are in suce. Thus, when the key and cam are in open position, as shown in the drawing, the intohes are withdrawn and the hood can be raised, but when the switch has been turned to 'off' and the key removed, the latches are released and hold the hood against all attempts to rel

the nood against all attempts to raise it. The engines may be run with the hood open, and the hood will lock automatical by when closed In a special record directly beneath the Yale lock is placed a vibration record er, resembling a pedometer in appearance and action, which is held securely by a plate provided with a spring to press against the back of the instrument. The vibration recorder is so adjusted that it will not be affected by the running of it will not be affected by the running of the engine which the are is at rest, but will record the vibrations of the car when it metion. The plate is sealed by a virte and lead seal and also by a strip of paper pasted across the back with the owner's name written thereon, and if these seals are broken explanations from the chaufbur are in order, as he is the native name across: the owner who has the chauseur are in order, as he is the only person except the owner who has access to the bood chamber. The switch can be removed without distorbing the scaled chamber holding the receder, but only after the bood has been raised, it is impossible to ramore any just of the mechanism from the exposed side of the death

RATIS TOTA OUT STRATES (Gostinued from page 82). Symphics and in order to apply it, the springs must be relieved of the weight of the car. To do this, spoly judge for coverns of the frame, and course this sailly the tires are clear of the ground The tweight of the nates and whent with



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AMERICAN LAVA CO. CHATTAROOGA, TESTS



(Fontinued from page 70)
then be suspended from the springs, and
in almost all cases it will cause the leaves to superate sufficiently to permit the lubricant to be introduced by means of a thin hiadded table knifa

CLEANING THE OILING STOTEM it occasionally happens that the offing lickening of the oil or the introdu

In the majority of cases this ma leared away by draining the oil from cleared away by draining the oil from the tank and crank case, putting a plut or two of gasoline into the tank, and cranking the engine briskly The gaso-line will thus be forced through all parts of the system, and will cut out the thick oil and dirt. Before rediting the tank with oil, the gasoline should be drained out and time allowed for it to drip out of the piping

of dirt and grit.

CUTTING A GARKET

To prevent the leakaga of oil the cover of a gear case usually rests on a gas-ket, which may easily be injured or destroyed when the cover is removed. Its replace, but as a matter of fact it is a testion of only a few minutes work replace It

The material to use is smooth and un creased brown wrapping paper of me dium weight, and of a surface that is no dium weight, and of a surface that is not too highly glazed. Clean the top of the guar box and lay the paper over it, then with a light hammer tap the paper where it rests on the outer edge of the flat part. The edge cuts through the paper where his hammer arrikes, and to get the gasket to proper shape it is only necessary to follow the edge all around To prevent the slipping of the maper, the to prevent the slipping of the paper, the first step might well be lo cut two boil holes through it, and lo leaser the boils. The holes are out by striking the paper over the boil holes in the gear case, using the ball end of the hammer.

The inside opening is cut in the same manner as the outside Before applying the gasket, give one side a coat of red lead and the other a coat of sheliac, and in placing it in position have the shells side down, or in contact with tionary part The gasket will then cling and will not be forn on any sub-sequent removal of the cover

A gasket made in this way will give excellent results under the detachable bed of a marine or stationary engine, hut after fitting it the engine should be run sufficiently to get normally heated before finally setting up the nuts or before finally setting up the nuts or bolts that secure the head to the cylin-

Aside from its unsightliness, a dent in a tube, radiator housing or other metal part may interfere with operation, and it becomes necessary to remove it To do this form one end of a piece of stout copper wire into a loop, and solder it to the lowest point of the dent. Then exert a strong and steady pull on the wire, at the same time tapping the borders of the dent with a light hammer. When the iont is thus pulled out the solder may be melted off and the finish restored with

ne emery and crocus cloth.

A dent in a gasoline tank is more dif A dent in a gasoline tank is more dif-ficult to remove on account of the great-er siffness of the metal, but it may be accomplished by the uso of a discarded valve. Clean the valvo head with emery valve Clean the valve head with emery cloth and solder it, not to the bottom of the dent, but to one of the aloping sides. The valve stem then forms a sort of lever by which the dent may be

The copper and brass piping used for soline and water connections has a passine and water connections has a tendency to spill, and an injury of this sort apparently calls for a renewal of the part. This, however, is not always necessary, for a permanent and sightly repair is a comparatively simple matter.



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The work is begun by winding No Is soft copper wire around the soft portion talk some make with the soft portion talk some make with the soft bean a last

of the pipe, and a half-inch beyond on and. Then, after heating and applyt soldering solution, the windings shot be soldered together and the outsi somering solution, the windings smould be soldered together and the outside windings soldered to the tube. This will form a tight jacket around the spitt portion of the tube, and will save the

LINING UP THE WHENA

LIKEUR OF THE WEIGHT.

While it is not generally realized, yet it is none the less true that the failure of tirse to give good service is in many cases due to the wheels being out of like. This may be caused by minadjustment, sprung steering-rod or arms, a wide in the axis from road shocks, all of which result in the rother the whoels of the product of parallal with the context like out of parallal with the context like out of parallal with the context like of If the wheels are set corre they will have a true rolling motion on the road, and the slightest deviation from this position will set up an additional silding action that is destructive to the

tire surfaces.

In testing the parallelism of the wheels
it may be taken for granted that the side
members of the frame, as well as the
syrfugs, are parallel Surfug with a
rear wheel, measurements should be made of the distances between the spi and the forward and rear portions and the forward and rear portions of the felice, at points an early as possible on the level of the axis. These measure-ments should be equal, and should be the same as corresponding measurements made on the opposite side of the car. If the figures indicate that the wheels are equally out of parallel with the springs.

equally out of parallel with the springs, matters may be set right by making a proper adjustment of the radius rods. To test the front wheels, manipulate the steering gear until measurements how one wheel to be parallel to show one whoel to be parallel to its spring, it will be necessary to adjust the storage arms of the two chunchies. Another method of testing fine whose is to stretch a string along the sides of a front and rear wheel, just above the actie. With the steering pare set for straight running the string should turned. straight running the string should touch each wheel at two points, as indicated in the diagram If the wheels are not true, the string will touch at one point only se illustrated

The writer was once called on to lo-cate a knock in an automobile engine be-longing to a doctor There was no ques-tion as to the cylinder, nevertheless even the use of a stiff wire, one end held in the teeth and the other resting against the engine, failed to determine whether the trouble was in the crank pin or wrist

The sight of a stethor The signt of a sustroscope in the coc-tor's pocket suggested its use, and the knock was immediately located in the wrist pin. A stethoscope now takes an important place in the writer's testing important place in the writer's testing coulpment, and he believes that it will be found invaluable in the repair shop by its use locences in a ben'ing may be detected long before it becomes services, again agree may be head blasting past worn platon rings or pitted valves, and other noises that indicate alight half of the property of the property

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We have told in a book-which we ask you to send for-one of the greatest business stories ever told. A story of how John N. Willys stepped in two years to the topmost place in motordom. Of how Overland automobiles rose in 24 months to this year's sale of \$24,000,000. How a factory has grown like magic to a payroll of 4,000 men-to a daily output of 30 carloads of automobiles. And how a large part of the demand of the country has been centered around one remarkable car.

The Discovery

Here is an outline of the story-just enough to make you want it all

Two years ago, Mr John N Willys was a dealer in automobiles There came to him one day a remarkable car—evidently the creation of a mechanical genius. The simplest, sturdiest, smoothest-running car that anyone around there had seen

The name of the car was the Overland And the price-then \$1,250-was as amazing as the car itself

The sale of this car spread like wildfire Each car sold brought a call for twenty others like it. Old and new motor car owners came by the score to deposit advance money-attracted by the Overland's matchless simplicity

But the cars did not come And when Mr Willys went to the makers he found them on the verge of receivership.

The genius which had created this marvelous car could not finance the making, in the face of the 1907 panic.

The New Start

Mr Willys in some way met the overdue pay roll-took over the plant-and contrived to fill his customers' orders.

Then the cry came for more cars from every place where an Overland had been sold. As the new cars went out the demand became overwhelming. outgrow

Anoth but the

Dura sent ou mand w

Dealers fairly fought for preference. Buyers paid premiums. None could be content with a lesser car when he once saw the Overland

All this without advertising. About the only advertising the car ever had was what users told others

The Pope-Toledo Plant

Mr. Willys' next step was to buy the Pope-Toledo factory-one of the greatest automobile plants in the country This gave him four well-equipped factories-just 16 months from his start

But the Toledo plant wasn't sufficient So he gave his builders just 40 days to complete an addition larger than the original factory

Then he equipped these buildings with the most modern machinery-with every concervable help and convenience—so that cars could be built here for less than anywhere else

Now 4,000 men work on Overland cars The output is valued at \$140,000 per day The contracts from dealers for this scason's delivery call for 20,000 cars

Now this man has acquired 23 acres around his Toledo plant. And his purpose is to see -from this time on-that those who want Overlands get them

Marvelous Sales

The \$1,000 Overland

This year an Overland-better than last year's \$1,250 car-is being sold for \$1,000 That is because the trainendous production has cut the cost 20 per cent.

A 25 horse-power car, capable of 50 miles an honr, for \$1,000, complete with lamps and magneto Never did a maker give nearly so much for the money.

There are higher-powered Overlands for \$1,250-\$1,400-\$1,500 They are just as cheap in comparison as the \$1,000 model

The Overlands are unique in simplicity They operate by pedal control A ten-yearold child can master the car in a moment

They are made in the same factory, and by the same men as made the Pope-Toledo-a \$4,250 car The reason for the price hes in the production of 125 cars per day

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F A. Barker, Sales Manager,

The Willys-Overland Company

	Overland models before the first car was de- livered. That means that each Overland sold the previous year had sold four others like it. And without any advertising.	Please send me the book
ig the next fiscal year these factories	This year's Overland sales will exceed \$24,000,000. Yet the Overland is but two years old.	
1	audite 1	-



Two of the many Overland Models



del 41--Price \$1,400. 40 h. p.- 112-inch wh

(Concluded from page 72)
gine until the platon is in this position,
and then adjust the tappet until the igniter just breaks contact and the bei niter just breaks contact and the beil stops ringing. To lest, crank the en-gine until the piaton sgain makes a compression stroke and the beil begins to ring Continue to crank, proceeding slowly, and observing the position of the piston by means of a wire passing the piston by means of a wire parasing through a retilet cock, or by marks on the flywheet. The bill almuld stop ring-ing at the instant when the piston reaches its topmost point.

LACING A PAN DELT

LATING A PAN DRIT
The requisitor for joining together the ends of a flat iscer bit are rawhide lare ing % or % inch wide and a round yung to f such abor that it will cut a into in which the latting will tunke a anug fit. For a fan bit of average width thems being work by mynd in the latting will tunke a song fit. res holes may be punsied in each end the outside holes % inch from this end and the outer one % or % inch in, the holes in the two ends being in line. The hinks in the two cods being in time The relative positions of the holes are shown in the discissor. The heing is pussed through the holes in the number indi-cated and drawn tight. To secure the end a cut to made on each edge of the lacing, extending inwardly for one-quar ter of the width, the knife being laid flat on the beit. The lacing is cut off % inth farther up. The end may the b. latte need out, and the wines formed by cuts will prevent it from pulling through

The hole

The beit will stay in position only
when the attiches in contact with the ey are paraticl to the pulley cite the best is placed on the puthry so that the significant attition are in contact with the puthry face it will lend to ride off

the pulsey face it will lead to ride off
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may be used in place of rawhide The
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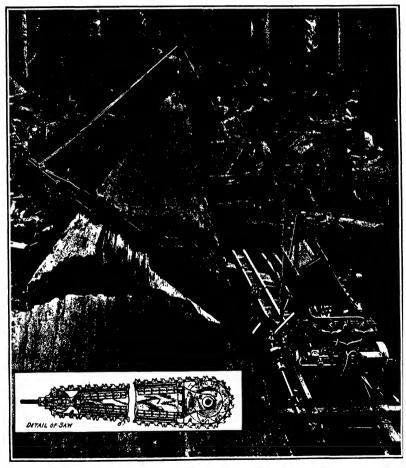


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RENNAN and Schart, each working independently of the other, have recently proved that a car constainting a plat of gyroscopes can be ruf upon a single rail end maintain its stability under varying conditions of eventric loading, side wisds, and curving track. Upon seeing a practical demonstration of this fact, and submitting the rail. See the writter recently did, to various severe and successfully-answered testing the second successfully-answered testing the second successfully-answered testing. and successfully-endured testa-it is natural; in the first motean of enthusian to proded an immediate and widebread application of the system, or even the eventual handonment of the present twe-rall track and trades in favor of the monosuli type Sober mod though, however, must confuse any thoughtful and practical mind that, in spite of the brilliant results of the recent demonstration, he monorall grocessing of the production of the product wopie car, in the nature of inings, can have only a more or less limited application under presenting, conditions. We wish it to be distinctly understood, of course, that any criticisms which follow are in no sense heatile, and are made with a full appreciation of the skill and knowledge, both theoretical and prac-tical with which the car was believed to the little of the skill and knowledge, both theoretical and practical, with which the car now being shown in this

city has been developed.

The Can—Mainly because of its perfect adaptability to take the curves, whatever the degree of sharpness, with a minimum risk of devaliment, the promoters of the system claim that trains of this type will be run what minimum makes of sevalues the promoters or as a speade from fifty to one hundred there can remain than those that are possible on two-rail track. Now the sevalue is to complete with the old, the invalue must provide at least the same expactly and countor as the present Pullman trains. It is stated that, in such cars, the weight of the groccopes will be of the present pullman trains. It is stated that, in such cars, the weight of the groccopes will be not present pullman to a present pullman to a present pullman to a present pullman to the present pullman to the pullman trains. It is stated that, however would be lightness by the reduction of the number of wheela per truck from six to say four, and as the sailes would be shortened, it is proble that the weight awe'd in this way would be about of the number of wheela per truck from six to say four, and as the sailes would be shortened, it is proble that there would be any reduction in the weight that there would be any reduction in the weight the there hand, we would be one reduction in the weight the there has no would be any reduction in the weight of the care as e whole. The groccopic mechanism, on the hear hand, we would be an extra cost and certainty not there has the would be one reduction and and the present the present the results of the care as evalue are care and extending the color of the number of the present the care of the present t other hand, would be en extra cost and certainly not a very light one. In the very nature of things, it other hand, would be so extra cost and certainly not a very light one in the very nature of things, it are lightly not to be a very light one in the very nature of things, it is not to the result of the result of

ter is reached, it would be advisable to incorporate it.

The Track —Although the claim which is so frequently made that there would be a simplification of

the treek and it issueshing of his cost in particular to the freek three defrantings report to the properties of the pro

posed speeds of one hundred miles an hour and over,.
In the case of long-pain bridges, the concentration
of the weight on the conter of the floor would spill for
the results of the content of the floor would spill for
case of deck bridges where the floor is laid upon jie
top chorfs, the truesse or jaints girders might, be
brought somewhat closer legether.
The cost of unstatemance would undoubledly by con-

The cost of maintenance would undoubledty be con-siderably reduced, since the labor entailed it is temping two rails to gage and it maintaining the proper super-elevation of the outer rail to accure would be entirely eliminated. On the score of safety, provided a sub-able form of track were built, the argument is entirely in favor of the greecopic our, and especially so on the

turves.
It seems to us that if there is a future for the new system, it will be found in the construction of ploneer rallweys through undersloped country, and particu-larly through mountainous and hilly country where traineys invogas unsystematic country, and parties alrely through montalsacopu and allily country where solicalizating qualities of the car essale it is never as a considerable of the car essale it for an around curves which would be altogather impossible for a two-track railroad. The monoral track could be located around a bill or bill, through which a two-track railroad would have to pass with heavy and carponalve excavation. Moreover, for this class of railroad a much lighter car would be practicable and or tremty high speeds would not be demanded. This decrease in weight and speed would most a great remote just the contract of the speed would not be demanded. The decrease in weight and speed would most a great remote just the contract of the speed would not be demanded. The decrease in weight and speed would mean a great remote just the contract of the speed would be contracted. The contract is the contract of the speed would be produced to the speed with a speed of the speed would be produced to the more important lines of travel, and oversually, it is que main truth roles of travel, and oversually, is the main truth roles of travel, and oversually, is the main truth roles of travel, and entually, to the main trunk roads

INFORTANT INVESTIGATIONS EDGARDUTE THE PROPERTY OF SELFA.

M PROPERTY investigations, marking a new era in the study of the propulsion of ships, are about to be undertaken by the Naval Architecture Department of the Massachusetts Institute of Technology, notice the direction of Frod. Cacil B. Peskody's based of the department, and a corps of samplatoria based of the department, and a corps of samplatoria.

Airendy a navigable forty-foot model is in pro-Already a navigable forty-foot model is in process of construction, funds for the unintenance of this work being previded by a friend of the department, in order that the investigations may be of a president nature, directly connected with the actual conditions of ship propulsation, the model is being patterned after the U S. S. "Attanting," and will be on a co-stift, scall. The choice of the "Manning" as a type of ship for the experiments is made because Prof "Babody, substitution of the Control of the Control

tenis" and "Lustranis" Mesers. Denny Brothers of Dumbarios, Maghaid, have a private model basis in which they have devided now of the passes werend, the "Okaki," which was bettle by this first, passes werend, the "Okaki," which was bettle by this first, just such a narrigation model was used to determine the canacity and power of the novel, combination of re-irprocating angients and lever-private trifficials. The department has been promised the posperation of the model health of the Weldmann and York, and the preliminary topic age to be middle libers viety doin, the N

casily transversed to ornar natio as new wars, pro-gresses.

Upon the completion of experiments with the should built and equined to correspond with the privileype, various forms and incations of propelars with its pro-parisonness good, belieflagt virt and driple-covery pro-parisonness good, belieflagt virt and driple-covery pro-parison to the property of the state of the pro-parison to the property of the state of the pro-tine turbuled by the property of the state of the changed so far a may be written redulfing, and the hulfs of various forms of shipe will be built to expend the contract of the property of the property of the pro-tine turbuled by the property of the property of the pro-teed of the property of the property of the pro-teed of the property of the property of the pro-teed of the property of the property of the pro-teed of the property of the property of the pro-teed of the property of the property of the pro-teed of the property of the property of the pro-teed of the property of the property of the pro-teed of the property of the property of the pro-teed of the property of the property of the pro-teed of the property of the property of the pro-teed of the property of the property of the pro-teed of the property of the property of the pro-teed of the property of the property of the pro-teed of the property of the property of the pro-teed of the property of the property of the pro-teed of the property of the property of the pro-teed of the property of the pro-teed of the property of the protect of the pro-teed of the property of the pro-teed of the property of the pro-teed of the protect of the pro-teed of the protect of the protect of the pro-teed of the protect of the protect of the protect of the pro-teed of the protect of the pro-tect of the protect of the

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furthermost, of the department.

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The personnel delents on Martian catche will provide never be settled. Before the British Environment and the second service of the British Environment and the second service of the second serve their risers. Mr. S. A. Sanghara signalisation are produced to them as Monta (Willes W. Willes S. Williams and potential states and Monta (Willes W. Williams). The second service of the contain papers of the Sanghara Sanghara (S. Sanghara S

Scientific American

Mis Mark Christian Layer Space Protes Principal Separate San Section Layer Space Protes Principal Separate San Section as societate to its attering gener. Philips has helt an appears to the severing grant.

Ma. R. Sandoneed early 1910 is also discrize motor power will be used as far north & North White Philips. The delay at Wakefield now made appearant by the change from electricity to steam

be done away with.

The same in the

"Shi State Commission of Highways of New York has saided for an appropriation of \$80,000 to be used by the Smighthesion in developing appriments in occommical hetes of road construction which would be suitable to us weights and classes of traffic.

he Public Service Commission of the State of New Tork for the First District, will soon open hids for \$7.77 miles of variet transit lines. The somer work NATE MILES OF PARIS TRANSIT HERE. The somer work this be begun on these subways the somer will the Strikks convention be done away with.

A General machine manufacturer has invented a new maps: of power transmission by the use of steel wire. It is claimed that the system is equal in every why is leather belt, steel bands, chain, etc., and is massh; chapter. The wires are thin, and endem.

why to lettler bells, seen unter, comme, von annu-sured, happer The wires are thin, and codies. "She Whirld Learning the Premier of the Dominion of, Canada, has knuched a bill which calls for the superdivare of \$15,000,000 for a Canadian navy of 11 shigh. The present indications are that it will carry \$ perbacted cruisers and 6 destroyers, to be built in

A special Board of Fire Control has been named by the Secretary of the Navy, to look into the question of the value of the military mast which has been in-ratiled on battleships, and report whether other masts of the same type should be placed on other vessels of the fi

Since introducing the "Pay Within" cars in Phila-elphia the number of accidents to persons has de-reased 74 per cent. This is attributed to the arrange-nent of the closed doors and steps, making it impo-tible for passengers to get on or off when the cars

We regret to note the death of Dr. Charles B. Dudsulting chemist of the Pennsylvania Railroad ident of the American Society for Testing Materials and of the International Society for Te is. His contribution to the railway world was ost Important one

The total length of the new Manhattan bridge co-ecting the boroughs of Manhattan and Brooklyn The total length of the new Manhattan bridge con-necting the broughs of Manhattan and Brooktyn is 6,855 Sect. The total cost of the bridge, including real estate, is \$15,833,800 The weight of the cables is 6,800 tons. There is provision for four trolley and four elevated tracks, one 35-foot roadway, and two 1-faot pros

Durcing the remainder of the winter season vessels of the Cunard Line will side directly to Flahgard. On the Cunard Line will side of the Cunard Line will side of the Cunard Line will see that the Cunard Line will also see that the cunard will be seen for cold more than 3.00 passengers have made use of the facilities which have been provided and have expressed themselves as being well pleased with the saving of time which is effected by outling out the trip to Livrapool

Mids are being saked for the seats and frames of the Stoney gate valves to be embedded in the ma-soury of the twin locks at Pedro Miguel, and the soary of the twin locks at Pedro Miguel, and the upper twin locks and the spillway at Gattan, on the Panama Chanal. Hach valve is designed to operate in a well traveling on two roller train bearings with a span of ten feet from center to center, fastened to the derry-stream face of the wall casing Rach valve closes an opening 8 betw wide by 15 feet high.

an opening I feet wide by 18 feet high. The felley of passeage trains is often coursed by a too allow method of admitting the passeagers to the tenhas when the train platform is often cream-different tenhas to the state of the course of admitted one by one, there is always more or issue. This can be avoided by a second series of gates. The examination of ethicies is made at the first passea, which is then opened in ample time prior to the de-partyre of the train. The passeagers are then the parkyre of the train. The passeagers are then can raisly to despert, when a number of gates can be true, spik just the passeagers of the passeagers parkyre than the same passeagers are then the passign to despert, when a number of gates can be true.

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(Albe K. T. C. D. D. Co. has asked the up-dista Public Berrico Ammunicos se recogno the investigation which is presented by the control of the property of the population of the compiled historic wife in property of the pro

ELECTRICAL

The question of using low-tension metal finness iamps in receiving considerable attention abroad. Transformers are being made for this particular pur-Transformers are boing made for this particular pur-pose, which are fitted with interruptars, so that they may be used on direct current lines. It has been sug-gested to fit each lamp with a transformer The fila-ment of the lamp could be a closed circuit, forming the secondary of the transformer

A simple method of clarifying the air of a room has recently been suggested. It consists of an elec-tric fan or ventilator, which is operated in a cylinder and from a reservoir above the fan a liquid is air lowed to drop on the fan blades. This is thrown out against the cylinder in a spray, through which the air drawn by the ventilator must pass. This serves air drawn by the ventilator must pass. This serves to collect the dust from the sir. The inventor of this system proposed the use of streerine or scapsuds, but it has been found that practically as good results can be obtained by the use of water.

A novel method of catching fish was described in recent issue of the Electrical Review and Western Electrician. A trolley line running between Frank lin and Columbus, Ind., skirts the White River for a lin and Columbus, ind, skirts the White River for a considerable distance, and it has been discovered that the trolley wire is frequently tapped to furnish cur-rent for fishing by electricity An end of the wire is placed in the water, and the current stuns such is piaced in the water, and the current stuns such fishes as come within its influence, so that they can be taken out with scoop sets. The trolley company and the Iudiana Fish and Game Werden are trying to break up this method of fishing.

The following estimate of the value of various electrical industries in the country during 1909 has

published in the Electrical	Werld
Diectrical apparatus	\$275,000,000
Diectric rallways	475,000,000
Central stations	250,000,000
Felephony	250 000,000
relegraphy	69,000,000
solated plant supply	75,000,000
discellaneous	. 50,000 000

\$1,435,000,000

The value of aluminium for the field coils of rai way motors has been tested in Germany It is faund way motors has been tested in Germany it is fenal that the aliminium takes up less space than the cop-per, although a larger mass of metal is required, be-cause ne covering is required. The oxide film on the simulatum provides sufficient insulation and there is samming provises summent issuances and there's no danger of destroying or weakening this insulation by observing as in the case of the cotton covering when the motor is overheated so that there is less dan-ger of short circuits. The principal advantage, how-ver, is in the reduced weight, as the aluminium coils weigh but half as much as the copper coils.

A writer in La Revue Electrique describes the en A writer in La Revue Richtique describe the or puriment of Richtesia Kernbaum to determin the ef-termine the Richtesia Kernbaum to determine the following the Richtesia Richtesia Richtesia Richtesia curry vapor lamp, and after short ten bours gas ap-peared to be forming. At the end of two hundred bours 360 cubbs millimeters (0 916 cubic luch) of gas was produced. The gas proved to be hydrogen, while the water showed that it was oblarged with oxygen the water showed that it was charged with caygen This apperiment explains the presence of caygenated water in anow and rain. It is proposed to use this method for sterilizing liquids, as caygenated water is an excellent germicide.

Now, that serial navigation is coming to be con sidered seriously new problems are arising, such as the question of navigation on stariess nights er over fog bound land, when the aeronant will be unable to rog count issne, when the seronaut will be unable to find his bearings. It has been proposed by a therman inventor that a network of wiveless stations be es-tablished over the land, each automatically sending out a predetermined signal at regular intervals, which out a producerimize against a regular intervals, which would be received by the air craft, and enable the aeronant to determine his course. The airships would not be required to carry transmitting apparatus, as a small receiving apparatus would suffice to enable them to avail themselves of this proposed system, and the weight of the receiving device could easily kept down to a few pounds.

the wagnit of the receiving series count easily to apply down to a two pounds.

A new method of determining the may of certained within his beam numagested by a reffere in the Electronic temployed. The magnitud wire is set to wradine, and the number of excitationary periodics is employed. The magnitud wire is set to wradine, and the number of excitationary the magnitude of the conclination Environary presents and forth being considered, so-critically in extended to the being considered, set of the conclinations. Letting if stand for the bumpler of certain the continuation of the

SCIENCE

Prof. E. E. Barnard of Yorkos Observatory has succeeded in obtaining a photograph of Halley's comet which shows a faint slender straight tail Ho far as is known, this is the first photograph to show the tail of the present returning comet.

A new estimate of the earth's age has recently been given by Prof William Morris Davis of Harvard For the usually accepted one hundred million years he estimates sixty million, based on an examination of the eliffs in Arisons and Utah where the time taken posit the strata can be easily come

One objection to glass roofs is that if they are not very steeply inclined, the water of condensation collects on their under surface, and instead of running down along the separating ribs of the panes or plates, and along the separating ribs of the panes or plates, and being ried off, drips upon persons or objects below, which is inconvenient and may be very expensive New where the panes or strips are abort, the path to the trough is too leng. The increase in length and width of the plates new used makes this difficulty of more and mere importance each year. One way of setting around it is, powers, similar to that employed systing around it it, powers, similar to that employed gatting around it is, however, similar to that employed in ferests and parks to prevent washing away of the hillside paths, namely, making inclined grooves to-ward the sides, only in this case the grooves are of hereachee shape, and form a series of parallel corruga-tions which carry the drops to the ribs which separate the plate, they then fellow these without much culty down the slant to the trough below. This sys may be employed either with glass sheets in wire is embedded or with plain plates.

We notice in a recent number of the Medical Record a letter from Dr Robert I Watkins, New York city, in which he claims the credit of having applied the movwhich as claims the credit of naving applied the mov-ing picture to the microscope. He states that as far-back as 1897 he demenstrated the machine to a private anddence, among whom was the Rditor of the Scien-Tific Assexicant The machine, known as the "micro-motoscope," was described in our issue of July Sist, notoscope, was cere-post in our issue of July 31st, 1897 Later, microscopic meving pictures were exhib-ited at the Grand Central Palace during the Trained Nurses' and Pure Food Exhibition, the pictures throws on the screen exhibiting the circulation of the blood in the web of a from's foot, rollfers in stagment water. in the web of a frog's foot, rottlers in stagmant water, an amabold leucoryle, typhold fever germs, and many others. Since that time Dr Watkins has greatly im-proved his routh apparatus, and gave a demonstration on June 17th last at Chicago before an andience of five hundred physicians of the National Evicatic Asso-ciation We may venture to point out that Dr. Comanden employs not the ordinary mirroscope but the

The third paper deating with the results of the Smithsoolian African expedition under Gol Theodore Rosseverth has just been insued by the Smithsoolian Institution it describes a new species of Octopes to which the specific names of referents is given a remainable of the specific names of referents in given a remainable of the properties of the properti staff to differ slightly from Octorson megalotis, which occurs ferther south, uspecially in color and in the tharacteristics of its teeth and skull. The octocyon is peculiar to Africa, and is not represented in the United States, but resembles in color the swift or kit fox of states, out resembles in coince the switt of this new form closely resembles that of the gray fox of our native fauna. This anneuncement is of special interest for the reason that comparatively few new forms were expected from this region in Africa as the territory up to this time explored by the Smithsonian African expedition has been pretty theroughly examined by

The water bottle for getting water fer analysis from selected depths in the cocan is a cylinder of hrass, German silver, or other metal which resists the cor-rosion of sea water, generally about twe inches in dirosum or see water, generally about twe inches in atemeter and twelve or fourteen inches iong, with upward-opening valves at the top and bottom, connected
together on a central stem. Lugs are cast on the side
of the cylinder for conveniently securing it at any
point along the length of the line by which it is to be point atong the length of the line by which it is to be lowered into the see During the lowering of the line the valves of the bottle are kept unesated by the pass-age of the water through the cylinder during its de-sent, but, when the metion is reversed, the valves seat themselves and are locked by the descent of small propeller in the framework above the appet valve, which ridges slity on a sieved during the lowering of the bottle, but descends along a serve thread to press the valves upon table seats when the line com-mences to be banded up. A specimen of the water at the law brought to the surface confined within the bottle, and a series of specimens from different depths may be obtained at one hand by securing a series of water bottles at the required intervals along the sounding line.

THE SCHERL GYROSCOPIC MONORALE

THE PRINCIPLE OF ITS OPERATION

Within the past few months Mr Brennan has ex hibited at London a car whi h runs npon a single rail and is prevented from fail ng over to either side by the resistan c of two gyros of ex carr ed on the car At about the same ime Mr S herl a German capital ist exhibited in Berlin a similar ar B ti cars were

The gyroscopic car inclines automatically to the

ried their loads successfully and in on h ase the gyroscopes maintained the car in a state of equilibrium—and they did this even when all it e load was placed to one side of the car or when the car was running d a urve

Apparently the inventors worked quite indepen of each other and it is a remarkable fact that in the essential elements for the control of the gyroscopic, mechanism they should have produced machines so broadly identical. The G rman car which is now be ing exhibited in this city represents the joint labors of Mr Ia i Freeli h the inventor who worked out

We are all familiar with the gyro-

tions per minute. We are all familiar with the gyrescope of the toy shope or the lecture room—the first mounted retaining in one the second in two escend in the escending in the first many the escending in the e

This tilting of the axis is known as its precession. If now we en deavor to increase the precession by pressing down upon the already tilted axis the latter will resist

tilted axis the inter will resist v 77 strongly and there will be developed at the annotime a large additional resistance to our depression of the side B of the board. It is in this advancement of the pre-ssion as Brenana alls it though the pre-cession be auson of he vigerous resistance of the sight wheel axis is not actually advanced) that the sacred of the successful proscopic or line as will be orident from the following der dytion of the outeraction and operation of the Scherl care.

Referring to the engraving showing a iongitudinal section it will be seen that the car which is 4 feet wide by 18 feet long is carried on two 2 whooled

completely incions both motors and flywiseld self the gyroscopes run in a perfect vacuum.—this to avoid the skin friction of the sir which would retard the speed skin friction of the air which would retard the speak, The cataling are mounted or transverse axes park, haded in the frame of the ear and they are theplates free to rook in a forward-off (freedom. The theignistic between the motors and the ousling is so small tigs, the heat of the motors can jump the imministing spik min-radiate away freely and "Resting up in questly avoided. The speed of rotation of the Lifeyangid, the wheels as we have stated shows, is 2000 per physics,



With three men on one aids, car tilts to opposite side, restoring equilibrium

restoring equilibrium.

The rocking of the gyroscopes is in opposite directions—

if the car is tilted to one side they rock toward, each

other and vice evers and to insure simultaneous and

equal movement they are connected together by held

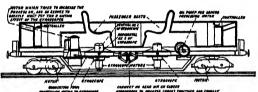
rank levers and two tocteds quadrants as shown in

the drawing. In front of the gyroscopes in an electri
still private oil pump for generating hydrasile pres
sure to drive a precession motor which is carried at a

the rear of the gyroscopes. The precession motor one

sists of a cylinder and plation controlled by militable

railway. These values are themselves operated by the valves These valves are themselves operated by rocking movements of the gyroscopes and the r



Longitudinal secti a through School gyrostatic car

the theory and data for the design Mr Emil Falcke who designed and constructed the car and Mr Scherl the owner of the patents

the owner of the patents of a first been or .—The simple gyroscope consists of a flysheel so mounted upon a system of bearings that its axis may be titted in any direction. The patent and most interesting behavior of the gyroscope is due to the fact that whe a flysheel so mounted is relating in a given place it resists any effort to change its lines of resistion by till ing the axis on which it is turning. The tendency of the flysheel to maintain its turning the constant of the contract of

ing to til it out of that plane is proportional to its momentum and since momen turn in reases di rectly as the weight and as the square of the relocity it is our tomary to use as small a weight and as high a ve-locity se possible Beace the fly jence the fly
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je mormous speed of \$000 revolu

awiveling trucks placed centrally below the longitudinal axis of the car. It is driven by two % horse power motors one on ear bruck. At each and is a controller and a box containing various operating switches. In the center are two seats accommodating four passes

mounted in the cer frame manesteat the sents are two gyroscopes one of which rotates lockwise the other anti-clockwise. The flywheels rotate normally in a horizontal plane on vertical axes. On the lower and of each axis as mounted an electric motor. The axes are journaled in strong steel airtight casings which



Old an I new method of rounding on

ments of the piston are caused through suitable mechanical connections to exact a tilting pull or push, as the case may be against the gyracope. The functioning of this most ingestiess mechanism is as follows When the car tipe or tends to tip to one side there is an immediate resistance tending to right the car accompanied by a precession (tilting) of the gyracopes This natural precession actuates the value of the precession actuates of the value of the precession which is turn tilts or attempts to tilt be gyracopes still further on its reverse acts and so between the precession. The ope however strongly resists



presently the gyroscopic flywhol will till have or all asserting to the discipline of its resulting, and their

View showing gyronogie metionents. THE SHEETS OFFICERS BOUGHTS ALE

(Phys. C. 1979). A state of the leaded side, if actually inclines away from it. This, however, is in agreement with the facts observed in our consideration of the greencys, where the pressure on one till the pressure of the pressure is the state of the pressure of the pressure in the unknowled condition of the car the greences were bolding it in a state of equilibrium with the consist of gravity varietal above the rail. When the senier of gravity vertical above the rull. When the hurse people slepped upon the oar the center of grav-larse people slepped upon the oar the center of grav-larse people slepped upon the oar the center of grav-larse people slepped upon the center of gravity of the state and the last until the center of gravity of the one and the three people was directly above the rad and equilibrium was restored 80 essattives the rad and equilibrium was restored 80 essattives the rad and equilibrium was the term in the relation that they begin to not immediately upon the contents of the state of equilibrium, they skert just the right amount of errestors force) and they become quiescent the sement equilibrium, its restored.

Another of our pholographic riews above the strik

moment equilibrium is restored.
Associate of our photographic tiews above the strik
hig bleacemans of a circ running around a curve upon
a stagle rail and inclining investig to the proper de gree to maintain the equilibrium. To practical rainread
mess this is overtainly the most attractive feature of the investion for it would mean the elimination of all the difficult contradictory and expensive problems ochiected with the super-deveation of the orticle rail or the present two-rull irredue. It is a fact that the car to so intelligent (we cannot help using the term) that whether the curve be easy or snarp and whether the car rounds it at ten or seventy five miles an hour it will lean inwardly with mathematical certainty to the exact amount required by its speed and the sharp

the exact amount required my its speed and the summer ness of the curre.

In the standard system of track the component of centrifugal force tending to hard the car over to the outside of the curre or cause it to jump the track is equalized by elevating the outside rail until the rent of gravity and centrifugal force falls normally a track. This condition can only hold true on any to the track to the track This condition can only hole true on any given curre for a certain speed Below that speed a train will grind on the lower rall above it will crowd against the outer rall. Not so with the groscopic car As soon as it enters a curve the pull of centrifu

car As soon as it enters a curre the pull of existing gli frore is resisted and the gyroscopes draw the car over to the inniée of the rail until the resultant of all the forces acting upon it passes through the rail. The gyroscopic car as above described is one of the most brilliant invancions of this or any ages But is it practical and will it pay. A discussion of this question will be loaded in our elitorial columns.

THE BEATH OF LEGH DELAGRANCE

After making a wonderful new record of 124 miles in 3 hours and 33 minutes on December 30th with a Bleriot monoplane Leon Delagrange who with Hour Farman was the first aviator to make flights with the crude Voisin biplane in France in the spring of 1907 et his death by a fall with the same mon met his death by a full with the same monoplane on January 4th while Stying at Bordeau. Our photo-graph shows M Bleriot with Delagrange standing at the left and Le Blanc another during pilot of the stands the machine which to like that Bleriot used is crossing the Channel and which Delagrange used on the day of the scrident A rather strong wind was blowing and according to cable reports when the machine headed into the wind the right wing sendently robe and the monoplane full to the ground

Scientific American

This is the first notified which has occurred owing to the collapse of an aeroplane when in the air We underscand, heavewer that come time up a similar accident happened to Latham, but without disastress results. One with of this Autointells monoplane the off and atood almost at right angles to the other wing of the justification monoplane to the property of pleaning is one side and warping the remaining wing. Latham was able to guide his machine down in circles and bring it sately to the grand dater requiring the wing he attached it in such a



BLERIOT AND HIS TWO PILOTS IN FRONT OF HIS NO 11 TYPE MONOPLANE

way that when he was up in the air he could putl a way that when he was up in the air he could pull a cord and cause the wing to break off as before He did this and tame down a second time with the wing broken simply to demonstrate that a broken wing did not not essartly mean disaster in the Antoinctte ma not not essentily mean quasarer in the Antoluctic ma-chine the wings are secured separatily to a must so that the breaking of one does not affect the other in the Bierich monoplane the wings are connected to-gether over a tripod the result being that if one breaks the other collapses and the machine is sure to be dashed to the ground

The death of Delagrange will put a damper upon the arder of some enthusiasts for a time but it was due to one of those unfortunate accidents which are always liable to occur in the development of a new art ris mame will go down to nistory as one of the martyrs of serial navigation He is the fourth aviator to be killed within the past four months the others be ing Lafebvre (who plunged to earth in his Wright machine) Capt Ferber (who struck the ground when er (who struck the ground when s Voisin) and the Spanish tallor machine) Capt Ferber (who struck the ground when making a turn in his Voisin) and the Spanish tailor Fernandes (whose small biplane resembling the tur-tism broke white he was making one of his first lights on December 6th hast). All four fatal accidents curred in France

A HEW RIGHLER TRIPLARE
One of our itiustrations shows the new triplane of
Mr A V Roe Mr Roe is one of the most persistent Mr A V Roe Mr Roe is one of the most persistent English axperimenters He has been working a long time and has finally developed a successful machine like triplase is ensuly a Langier type machine in trip-itate since it has tirre superposed surfaces forming a tail and attached like the forward places to a tri angular body. The motor is mounted in the body at the front end of the machine and drives a time bladed propeller mounted upon its crummhaft. The aviator sits in the body about half way between the main planes and the following planes or tail. The machine is mounted upon two wheels at the front and a skid at the rear It is 33 feet long and the planes have a great of 30 feet and 310 equates feet of emporting surface. They are set at an angle of free feet. They are set at an angle of free feet. The feet of particular places are at feet by 2 feet. I feet 1 feet have a spread of 20 feet and 320 square feet of sup

laines

Mr Roe has done most of his experimenting at

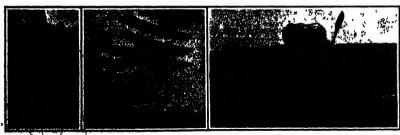
Nombley Park and recently the grounds have been
suitarged there so as to give him more room. He
see made a considerable number of short flights in a straight line and his machine is remarkable low power light weight and small spread

AVIATORS COSTURES AND A MACRIES FOR TRACKING RESISTERS.

Two of the photographs reproduced on this page give a very good idea of the costumes worn by French aviators and of the dress soon to be adopted in France by the lady operators or aviatresses. The costumes used by the men consist of overalls and jumper and a tight fitting skull (a) empiritely covering the head.

The contume being used by the lady operators consists of a loose blouse and long bloomers extending to The contume being used by the lady container and select of a loose bloose and loop bloomers cardening to the tops of the shoes. A skull cap similar to that used by the men is also worn. At the present time but two fadles have made slights by themselves in servolpiance in Prance These are the Rarchesse do is Roche who operator a Voisin bipliance and who recently met this as a richet by running into a tree and bitle Marriagt who is the first woman in the world to have the service of grice (al

getes (al Another interesting licture at the bottom of this lage shows a novel training machine for accustoming aviators to a monoplane of the Santos Dumont type This machine consists of a substantial iriangular body mounted upon three wheels and terminating in a tail mounted upon three wheels and terminating in a tail having movable vertical and horizontal surfaces by whith the machine is sieved to right and loft whan running along on the ground or by which the tail is made to rise a short distance in the air. The two made to rise a short distance in the air. The two bottom monther of the trinquisite frume are extended forward and met above a small wheel five or air feet ahead of the main wheels so that if the makine this forward when the tail rises the front whole keeps it from til jing too far A fearty-finder water-cooled motor of 40 horse-power is mounted upon a U shaped frame and carries - proposite in front on its trank shaft. The would water sit in a small near he-had. The machine is fitted with large wire wheels fitted with large diameter; pounts to tires. With this machine a beginner can inval at very fixed speed over utou with arge stameter pounds of tree. With this machine a beginner can travel at very fast speed over the ground and accustom bimself to the steering aide ways and up and down of a monoplane. The machine should serve a unserin purpose in training aviators who intend to fly this type of a roplane.



Horis tripless in Sight. Machine for familiarizing begunners with an aeroplane.

Scientific American

A POWER-DEVENT SAW,

The continuously running fieldle saw is by no
means a novelty to our readers. Its leading princi
ples are embodied in the hand saws now in consuce
use. Atthough effective for sawing number band saws are incapable of orose-cut sawing on large trees in the forest because the band necessarily runs in two

use. Athough effective for saving tumber band save retenerable of crosseout saving on large trees in
the forest because the band necessarily runs in two
planes. For the purpose of overcoming this objection
Mr R L. Muir has perfected a new style of endiese
cross-cut save which is feetible in a single plane
the file side of the save follows the save-cut through
the file side of the save follows the save-cut through
the file side of the perfect lies
to keep the save in perfect lies
the property of the save follows the save-cut through
the file side of the perfect lies
from the save of the save follows
the save and the save follows
the save and the save follows
the save and the save follows
and composed of save links 6 is
mounted on the guide wheels and runs on the string
edges of the frame The guide wheels on the frame
the save with runs continuously and which sakes a
single saw cut in the plane of its motion. The
save
moreover is adapted to all throat and saving its
mercover is adapted to all throat
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more o reover is adapted to all kinds ar d styles of mawing for which cither circular saws band saws or mech ically driven re inrocating saws can be used and for

andled cross cut saw being a familiar example
The chain saw is driven by a gasoline or electric The chain saw is driven by a gasoline or electric motor the inner guide wheel being geared up with the motor shaft as indicated in our front page illus-tration. The motor is carried on a shid which shid is moved slong on ways whenever a new cut is to be

made

Mr Muir has carried on extensive trials with the
saw in the wast redwood beits of Mendocino and Hum
boldt Counties in California with remarkable success
The most important advantage of his construction is
that of the speed One of his large saws it is as serted will cut through a tree having a diameter of e five to seven feet in less than ten minutes. By the old and slow hand process this same work would the old and slow hand process this same work would consume an hour and a half with two mon wielding the saw One of the machine sawe will accomplish as much as from 25 to 30 expert sawyors a wonderful saving in time and expense when it is considered that saving in time and expense when it is considered that only two or three men are second to operate a ma chine. The save can be run horizontally vertically or on an incident Trees can be saved within a few inches of the ground—a great saving thus being effected in stumy wate. In reliing trees of luminosa-sias by the slow chopping methods hundreds of sect of valuable timber are lost by chippage because it is notten necessary to cut up as high as eight feet above the level of the stump. The mechanical saw described avoids much of this waste

AN RESCREE PERFORATING PER

Though various efforts have been made from time to lime to evolve an electrical system of securing an

to time to evoive an electrical system of semi-midelible writing r cord which is com-plete proof against both forgery and fraud such devices have proved commerciality in practicable A Parsee inventor however Dr Dinahah P Ghadtall has evolved a simple apparatus which is very emicient it is called the antiforge pen which as its name implies is to render forgery impos-sible. The writing is made up of a series since The writing is made up of a saries of parforations burned in the paper The apparatus comprises a small box with a sloping lid measuring about 20 inches long by some 16 inches wide. The whole of the by some is inches wide. The whole of the electrical equipment is carried within the box or desk the lid of which is glassed and carries at its upper end a sheet of alumintum. The pen itself is of the ordinary stylographic type.

requisite current is drawn from a small f ampere storage battery as shown at A in one of the illustrations The bat tery is connected up in the usual manner to an induction coil B to which is fitted a small high-speed trembler capable of ad

justment by a thumb-screw on the outside of the deak Between the secondary terminals the coil a small cylindrics! condenser C is placed in order to increase the intensity and fatness of the

In an electric system of writing care must be taken to prevent the inside of such letters as o d r and so to prevent the inside of such letters as o d r and so to the through the trend in the water continuous. This possibility is obviated by means of the tremlier coil which makes the current uspidly intermittent. At the same time however residing waves of electrical en rising up to 10 000 voits instantly followed by a drop to zero. impose a severe strain upon the induction coll.

esty affect 11. To g and will in time seriously affect \$1. To guard alphabe such a result is between the interviewed an revent ferries which many he best described as a native well-to the cold. This is a highly calculated revenus toke, D which is also placed between the secondary terms to the cold with the secondary terms to the cold and the cold and anyon the cold and anyon the cold, and any resistance which may be offered to the passage of the alcetric nurrent through the pass is taken up thereby country it to few brillantly at the same time it also acts as a plant placed within the same time it also acts as a galvaneousler as before writing the operator shouly present the passages which may be considered the same time it also acts as a galvaneousler as before writing the operator shouly present the passages that dearly, and the receitant glow in the weeners



Specimen of writing with the electric pen-

tible indicates that the apparatus is working efficiently. The pair is about the same inegal as the ordinary foundain pen and its barriel contains a moreury bear for the connection with the coil is effected by a short length of festible wire carried on a spring barrel By means of the mercury break contained in the barriel the primary circuit is never closed until the pen in held in the sornal writing position. Bywes these the held in the sornal writing position. Bywes these the held in the sornal writing position. Bywes these the top the contained the consumption of the contained of the contained to the consumption of the contained to the consumption of the contained to the constant of a spring piston. It is only when the pen point is present quot not the paper wheyels the smeallic extremity is pushed inward against the mercury that the current can flow to the pas point.

extremity is pushed inward against the mercury that the current can flow to the pen point is all upon the To use the pen the sheet of paper is also upon the stimulianing pold which on its under side in connected means of a flat spring. When the point is present hard against the paper and the electrical circuit is completed the resultant spark burns its way directly through the paper leaving behind a distinct perfortorough the paper seaving besind a distinct performa-tion. The sire of the hole thus produced can be varied as desired from a large coarse perforation to a small almost invisible pin prick by the adjustment of a rhecutat the knob of which projects from the left hand

since or the cess.

With the metallic point only the perforated outline
of the writing is produced but it may be desired to
secure a legible distinct surface inscription as well
In this case the metallic point is replaced by a small

inns protects. Offer reason in class the single-special interest of the state of th

The Payrell of the Harr.

The Fayrell of the Navy.

To provide for the welfare and comfort of the offioers and emission man of the navy during the fleest
year of 1911 it is going to cost Unade Sam just \$5 767,
477. Of this amount over \$5 000 000 will be spent by
huy food for the 46 490 emission man, The Navy Deany noon for the es saw emission mes. The Navy Di-partment figures that it costs the government \$1.65 a year to feed each man, or just \$5 a month. The pay-roll of the sellated men in the navy during \$151 will aggregate nearly \$11.000,000. This sum will take care of \$1.725 in the general service \$44 men in the lamilar force and \$1.55 prisoners under sentence by court martial

insular force and 1128 princers under sentence by court marklis one-control of the me serving in the sawy in About one-control of the 43 852 allowed by less allowed by less and the sentence of the 43 852 allowed by less and exhibited to participate in the allowances for resent exhibited the participate in the allowances for resent exhibited in the consideration the 1000 or more appreciate band on the men in the service in June lest the average pay of the salisted men was 183 75 a menth. The prequisites allowed effects in the savy will agreeate nearly three-quarters of a million dollars in 1111 of the amount 454444 will be spent in providing best and light. The heaviest cost in the allowance of the salisted pays is in the matter of quarters for thiose mentions the same of the salisted pays in the matter of quarters of the salisted pays in the matter of quarters of the salisted pays for the salisted of quarters will agreeate 148 750 white the commutation of quarters will agreeate 148 50 outs for all will reach a total retions figured at 25 outs a day will reach a total retions figured at 25 outs a day will reach a total retions figured at 25 outs a day will reach a total retions figured at 25 outs a day will reach a total retions figured at 25 outs a day will reach a total retions figured at 25 outs a day will reach a total retirement. ters will aggregate \$485 780 while the commutation of rations figured at 30 cents a day will reach a total

An Electric Plant Operated by an Air Turbi

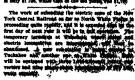
As Electric Final Operated by an Alt Turbian.

Near Hamberg Germany is a small electric establishment concerning which the following interesting
details have been published. The installation comprises 400 incandescent image and five electric motion; a
which drive a threahing machine a hay entire, a
cream separator and two pumps. The total
capacity is 40 kilowatia; The Heronics tur

like has a wheel 40 feet in diameter

nme name a waser 40 feet in diameter meuntrd on top of a steel tower about 100 feet high. The apparatus begins to work as soon as the wind attains a valocity of 10 or 13 feet per second. In this region a wind of this force can be counted on for 10 hours or 13 feet per a roomd in this region a was of this force can be counted on for 15 hours a fay on the average. With a visid of 26 feet per account for the room of the hours and the room of the room of the room of the hours have a considerable to the room of the room of











The investor using the perfecting

AN REDOTRED PREPORATING PRE

iength of graphite—that taken from an ordinary lead pendl acts excellently. Then in writing one secures a vitable surface record and when held up to the light a perforated record may also be seen in order to ob-viate the necessity of holding the paper to the light to see if the perforating is being efficiently effected, there is a small motable filtered hasps and reflector-flere in a small motable filtered hasps and reflector-ing the state of the series of the properties of the left hand did the writer can secondar the results by

errinand size the writer can associate the resums ty-camining the writing in the light transmitted through the glass desk life. By this method of writing it is impossible to preduce two algustures exactly ables, even if writing by the

· Correspondence.

i manufacture contra

tor of the State

Vit the Medice of the Semmyrrine Assumenas It your correspondent; by the Sense of Newember 57th well skudy the Selbewing System, he will plainly one that it is (suppossible to got 85 sets of 2 out of 115 so that no two numbers will be in the same set more

phás maco.						
1 1 1	1 611	1 713	1 8 18	1 9 13	1 10 14	
4 4 4	8 712	2 8 14	3 9 11	2 16 13	8 6 16	
7 1 1	8 8 18	2 9 15	2 16 12	8 6 14	8 711	
10 11 18	4 9 14	4 10 11	4 6 13	4 716	4 8 13	
12 14 15	6 10 15	5 6 13	5 7 14	6 8 11	5 9 13	
		-				

LOCALIBING GASOLINE EXPLOSION To the Editor of the SCHERTIFE AMPRICAN

LOGALINERY SAMPLEMENT XEPPLEMENT
TO the Midler of the EVENTERY ADAPTICALS
The recent exploring of a genoline tank on an automabile and also one in the vicinity of an autoboat both attended with intuities has augusted to my united a facility of an autoboat both attended with intuities has augusted to my united a facility of an autoboat both attended with intuities has augusted to my united a facility of the control of the c

ONTITIOUS REMETED OF A RILE

To the Editor of the SCRITTUTC AMOUNT AT WE all know that the middle and vesters portions which can be continuently blacked to form become which can be continuently blacked to form becomes and location can be briefly and accounted described. The last whole number that we reach by mobilision in this manner in Sect is 150 and this would see the continuent of the section of the sect

the after of a square whose area would be 100 square reds.

Continuing the bisection of this 165 feet through landers and fractions thereof we presently reach the length of 50 STI inches and fractions thereof we presently reach the length of 50 STI inches which approximates to the length of 50 STI inches which approximates to the STI inches steps by 00 STI inches an amount langue the length of the steps by 00 STI inches a manual tapper chable in social measurement by packing. Now this length of the steeps branch are and a manufact one of the 50 th bit to the end of the hand seathed one of the fourth American serve of 21 or 16 inches to 100 the 10

All themselved of consequential constraints to our stand and Manadorf of capacity in Stread in Architecturion to our stand and Manadorf of Capacity in Stread in Architecturion of Capacity (the State) of States I capacity of Capacity (the Capacity of Capacity

Scientific American

"quarter" heer instead of so many dimes or so many minutes, "helf" ten or "helf" pothed instead of so many porpule or cunces. Observe too that it (contin none bisection) is the mollood we use in deriving all

JOHN M BIRMON

SHORTING A RIPLE.

To the Editor of the Scientisto Ameri

To the Milion of the SCENTYION AMERICAN.
Therey mackmoan is familiar with the effect of raising or lowering the rear eight on his rifle. Perhaps on to commonly understood is the effect of raising or lowering both frest and rear eights simultaneously on point-blank range the target front and rear correctly pointed. The trajectory of the builet is correctly pointed. The trajectory of the builet is a corre intersecting this straight line in two points one of which is the conter of the target. It therefore follows that if a rifle is correctly sighted for correctly necessary of the content of the content

The most accurate shooting is done with 0 32-milber rides at ranges of from 15 to 50 yards and when once the sights are correctly set for one range no marks man likes to change them. It may therefore be of interest to know how they may be set for correct work at two ranges which may be a considerable distance

The path of a projectile in vecuo is a parab The path of a projectile is escue in a parabola and alone air resistance may be neglected for very short ranges and low velocities the parabola equation will be correct enough for our purposes. The equation is usually stated thus

y at me distance from the line of sights to the center of the gun barrel x the range y the acceleration of gravitation and x the angle between the line of sights and the center line of the gun barrel. The x lation of those quantities is all shown in exaggerated detail in the diagram u is the distance from the line of sights to the center

Since the angle s will lequite small for short ranges we may replace cos s with unity which is I ractically its equivalent thus simplifying the equation. This

Taking data from a Winchestor 0.22 rife equipped with globe sights and sighted for 70 feet we have y = 9/16 inch == 0.0468 feet v == 1.000 foct per se

Reducing to the form -+--#+--== 0 in whi h the 6

product of the roots equals the third term we have

$$m^{2} - \left(\frac{1100^{2}}{16 \ 1} \tan \alpha\right) x + \frac{1001^{2}}{16 \ 1} 0 \ 0489 = 0 \qquad (4.5)$$

Calling the roots o and z. o c. - 0 0468 14 1 1 000

Thus when one range is 75 feet the other is 39 feet update is too close to be of any use. We see also that the 75-foot range is on the failing side of the curve so that a Mittle greater distance will land the belief below the mark

To bring c, on the further side of s, it is avidently necessary that y must be increased or in other words both the front and rear sights of the rifle must be ele-

We will now find the value of y so that the gun will shoot correctly at both 7" and 150 feet. As before

$$a^a - \left(\frac{1000^a}{16 \cdot 1} \tan a\right) a + \frac{1000^a}{16 \cdot 1} y = 0$$
 (8)
Taking the product of the roots equal to the third

term 75 180 =
$$\frac{1000^{\circ}}{161}$$
 y y = 0 151 feet = 3 17 inches

Thus by setting the front sight 3.17 inches above the course of the hore and elevating the war sight till the gas aboots correctly at 18 fort it will be found Apic clerked, at 156 fact. Moreover R may be shown tight in page to the fact of the sight of the sight of the sight page time Ad inches. The angle of elevation of the by 1 recapit

sights may also be determined from the equation but it is much easier to get this angle right by means of trial shots, as it is very small and difficult to mean-ure. The determination is as follows in equation (3) the sum of the roots equals the coefficient of s with its

tan em 0 00000 a = 11 min. If sec Of course all the above recuting are based on the sammplion that the valocity is 1000 feet per second which is about correct for a 5 above taxtridge. Be-wards of the control of the control of the control Air resistants which causes the projectile to depart from a parabolic path will have the general effect of causing the tabular values of y to be too low but this effect is not very noticeable for the short range and the valocities with a recommon in 0.21 calibre marks

manably

The results are not intended to as ply to high power
rifes and long ranges although the departure of the
projectile from a parabolic path does not alter the
fact that any rife may be correctly sighted for any
two ranges within its limit



The Light of the Firedy

The Light of the Firedy
After r fering to the original work of Prots Lang
ey and Borry and describing accurately their methods
of investigation Dr H B Ives and W W (oblants
draw from tielr wn investigations the following very Interesting untitud u as to the relative officiencies of the light of the firefly and that of incandescent electrk lamus

m ien y of the light of the carbon flament The filen y of the light of the carbon filament lamp is 043 per cent in other words of all the energy of a med only 047 per c at is converted int light The lampshe lamp has an effi n y of 13 per cent and the mercity at 38 per cent. The effection of it is light of the first is 16 per and Making the comparison in another form the arbon filament lamp comparison in another form the arbon filament lamp has an eff long of 83 watts per mean homispherical condic, the tungsier lan | 16 per candle and the metallic are 0 watt per candle. In comparison with thes 1h Briefly has an efficiency of 0.02 watts per candle

The currons Reppleasent
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The currons Reppleasent
Internating article by the Emplish correspondent of
the Senature, Annat as no the Madras Harber Works
which lacted, a nouth heavies or arm 1 000 feet long
currons for engine the While means of illustration
forcervas for engine the While means of illustration
have been developing and the organized options of ditribution have ramified throughout the community
here has been another and very different development
going on via the growth of a branch of the science of
other which deads with the measurement of fundious
values and which has been embodied in whal is one
called Illustrating engineering, Dr. A D Rockwill
writes on the incandescent and are light in medicio
Carragama de toldas as it vas termed by the an writes on the incundence or and are light in medicio Cartagena de Iodias as it vas termed by the an elect governments and now spoken f in Colombia as The Herole City has more if the tracte and mole-dramatic in her history than any other to no or the western continent. The story of this community is told by lease A Manning. The year 150° marked his three honorestic anniversary of the ioverstice of the interest horizont. The story of the ioverstice of the lattery of the ioversion of the lattery of the ioversion of the lattery of the ioversion of the lattery tion by insects a rang forest fires

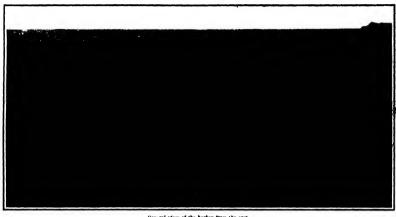
The Battle River Viadu t of the Grand Trunk Partific Railway 677 ½ miles west of Winnipeg com pleted in December 1908 is a steel plate girder viaduct 2 274 feet long between abutments and 184 feet high from base of rail to low water or about 139 feet aver age height above ground. It comprises a 170 foot deck truss span crossing the main part of the river channel one 70-foot plate girser span and fifty one 50channel one 74-root plate greer span and fity one or-foot plate grider spans saking on twenty six sted fowers. Thus the tower spans are of equal length with the intermediate spans, i = 50 feet. The substructure is of concrete the two Frer piers and most of the land footings being founded on piles.

THE NEW NAVAL HARBOR AT DOVER

BY THE ENGLISH CORRESPONDENT OF THE SCIENTIFIC AMERICAN

The harbor facilities of the British Admirally have been greatly extended by the recent completion of the many rate is experienced therest. There was no consumeration of any rate is experienced therest. There was no consumeration of the asstural side of the silight bay projecting any and extensive works at Dorse at a cost of nome with its additional or other natural harborier of which is the too convert the port.

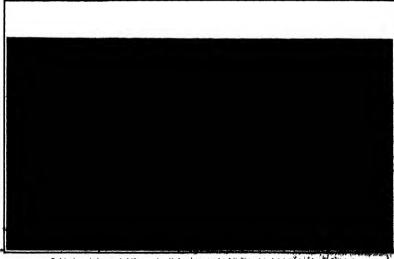
There was no consumeration of the asstural side of the silight bay projecting and the asstural side of the silight bay projecting the first to the use the reduced of 190 feet o



tioneral view of the harbor from the east

cal importance and the necessity of some refuge for war vessels in its vicinity was advocated some hun dreds of years ago tofortunately however its geo-graphical situation is an that it is exposed to all come between extreme cast and extreme west the

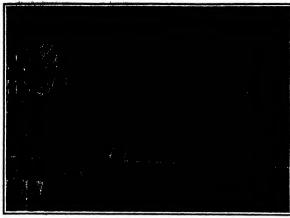
nto a harbor of refuge easily accessible in all weath ear and which would be completely and necessitated in the cross channel straffs with France and an intend Li was in 1886 that the government decided to convert the port late a national harbor with a low water works may be patient from the accompanying plan works may be gathered from the accompanying plan



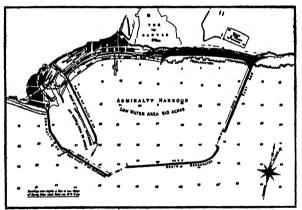
Rectained area in foreground of 23 acres where blooks were proposed and studied and work to bestdesing a second study. and have shine in mine

to which the new constitution is to distinct by the sections indicated in reli black. It in fell black. It will thus be seen that an aggregate tempth of 11 154 feet or over two miles of break water has been pect or over two miles of break water has been constructed. Ac case to the an aborage is so oursel by a gap isotrous, the west ern extractity of ern extremity of the sea arm and the Admiralty pier 740 feet in width and on the weather and on the width as a manufacture good of feet he width By this means a the hardor can be entered in any weather tided the trade in any weather tided in the means and all ing up within the model and all ing up within the reasons are prevented for a water to to 45 per a tildes and as to we will be the meanty in tides and as the weather and the meanty in tides and as the weather and the meanty in tides the within the harbor itself and the water depth is about 60 heet Within the harbor itself and the water depth is about 60 heet Within the water depth is a bout 60 heet within the water depth is a feet of the water depth is a feet of the water depth is a possible to the water depth is a feet of the

tions
The surveys showed that the sea bed consisted of chalk chalk mari and fints so that a solid foundation could be secured for the massing work is car-

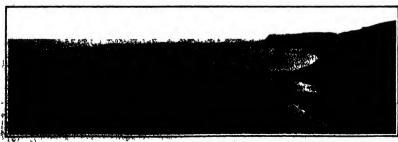


At entrune left, grab for clearing fundations at right, diving bell resty to descent At rear craces for setting blocks below it a water level
Staging at the telephona works.



Plan of the Dover harber works New structure shows in full black

ried out in solid mason ry the blooks ra set in a control to the c



Complete view of Dover Say and Sarbor

Scientific American

ing. The subsqueous work was accomplished by most of diving bells. Most of these had an internal me urement of 17½ feet by 10 feet and 6½ feet headron. nrement of 17% feet by 10 feet and 61% feet headroom with a weight of 35 tons when out of water and about 5 tons when submerged. They were fitted with telephonic commandation and were provided with electric lighting. The see hed was first cleared by means of the grab excavators to within about 13 fairbes of the remnistic level. Then the diving bell descended. and the men within completed the work and excavated to about 2 feet below the level for the foundations of ic about 3 feet below the level for the foundations of the superstructure. Owing to the servicy at the econs and tidal action the foot of the breakware on its outside its client in the foot of the breakware on its outside in the foot of the meanure apron about 25 feet in slidth built up of concrete blocks ranging from 30 to it one in weight and 5 feet in links deep. The bod for the aprox was excavated to a depth of 3 feet by divers. From foundation level up to low water the blocks are bende to greatly a tempt of the blocks are bende to greatly a tempt of the blocks are bende to greatly a tempt of the blocks and considered in 3 to 1 concrete sames diversed of circular section. Above low water the courses are bedded and ground in 3 to 1 cement morter while the outside blocks above the point are freed with grantle the sames below with point are freed with grantle the sames below with point are freed with grantle the sames below with this point are feced with granite the stones being well

onded into the concrete matrix

The reclaimed area lies at the foot of the cliffs and The reciaimed area lies at the foot of the citifs and has a length of 2500 feet by a maximum width of 350 feet the space bing some 23 arras On this expanse it is intended to creet the various buildings required for repairs stores and so forth as well as two pro-coted reservoirs for the storage of gaseline for sub-marines a station and depot for which is to be established her The castern arm projects seaward from the eastern extremity of this reclaimed area in a south erly direction for 2942 feet The construction of this southern breakwater was among the most difficult of

taking owing to its taking owing to its exposed position and the great depth of water. The average depth on this section of the foundations be of the foundations be law low spring tides was about 47 feet the greatest depth being 53 feet Work was commenced in Au gust 1904 and by De comber of the same year 480 feet of foun year 480 feet of foun dations was compict ed and the masonry brought up to the level of low water When the extension on the western pier on the western pier had been completed and the plant there need was transferred work was maintained at a much higher pressure 2 000 feet of foundations ball-

roundations weing roundeted in a year while in two months ainne tl4 blocks were set in position

blocks were set in position

The width of the structures at foundation level
ranges between 52 and f7 feet. In the case of the east
or arm the white at deck level is 47% feet white that
of the southern breakwater is 40 feet and the Admi
attly pier extension 45 feet. In all cases the height
of the deck level above high water spring tides is the
same vis. 10 feet. same viz 10 feet

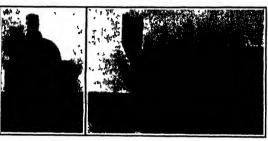
same vis 10 feet. The existing Admirally play was The extension of the existing Admirally play was commenced in August 1899. This arm was to be don bled in length that is to 4 600 feet and in this case uwing to the existence of a revolving gun turret in the cold play head which it was decided to retain the play had in be widened for a distance of some 800 feet in order to neveril it or mitted tracks section; the steam order to permit the railroad tracks serving the steam ship berths to be late

th the western and eastern piers are provided with a parapet il fert and 10 feet wide respectively the top af the former being 41% and that if the latter 99 feet above low water The deck af the south break after bowever is quitte level though similar prou can here be made if and when desired

vision can here be made if and when desired. The works have given employment to from 1 500 to 1 800 mm and consid ring its character the accidents and fatalities have been insignificant. No deaths or permanent injuries were recorded in connection with permanent injuries were recorded in consection with working in compressed air either in the driving beils or diving drasses. During construction several south ring incidents occurred. With the south breakwater was under construction the liner "Douterhland run into it serviculty channing in term and removing a mean of manonity. As a result is versal blocks had to be renored and reset." To carry out this work as in praisons bydratific runs was emeckally volved compris as a broisenst driving to the broad or the contract of the work of the service is removed and or the contract of the co of exerting a lift of 180 tons by mount of which the

blocks were lifted so as to be gripped by the Golist crames and then reset. On another consider a visib while entering the harbor feeled the timber simple; The collision was so violent that the two entering rance were carried away and considerable dataset. ranse were carried away and considerable dates; nulcical Server delays contract through gales. It consequence of the exposed character of the position, the full force of the southwesterly and easierly storase was experienced the waves eweeping over the works. Owing to the elaborate precautions adopted however uving to the emorate precentions adopted however no valuable plant was lost though at times the heavy staging showed striking oridences of the battering by wind and wave It may be mentioned that the quan-ity of water required during an ordinary spring tide and which flows through the two entrances is 17000

A NOVEL BOILER AND FURNACE CONSTRUCTION The furnace and boiler illustrated in the accomp The formace and boller illustrated in the accompany in engravings possess many decidadly novel features which nevertheless have proved efficient in practice. The grains of the furnace is enured up at each olds of the boller so that the forward part of the boller is half subnemped in the foul which comes in direct contact with the boller half! The fire burns it way up through the coal which as H is consumed feeds downward from opposite sudes of the believe while there is a downward from the four the believe while there is a downward from the first through the coal while there is a downward from the believe that the subness of the subness of the believe that the subness of the subness o while there is a downward draft through the coal which carries the games to the bottom of the furnace and here they combins with air that passes through admissions at each side of the ash pit and flows be tween the grate bars up through the incandescent tue! The barring games then flow through a nar row neck into a corrugated flue of largo diameter which conducts them. Lat. which conducts them to the rear end of the botter after which they pass through the botler tubes to th



Front elevation and longitudinal section showing the curved grate and interior details of the boiler.

A HOVEL BOILER AND PURMACE CONSTRUCTION

stack Groat care is taken to proportion the stack to the surface area of the tubes and flue so that the highly heated gauss will pass slowly through the boller and doliver the maximum number of heat units for the gueration of stam. The side grates boiler and doliver the maximum number of seat units for the grates of the furnary are provided with rocking parts of the furnary are provided with rocking bars which was been appeared individually but they are prefer ably connected to a single shaft as above in the its content of the provided with the party prefer ably connected to a single shaft as above in the theoretical party which they may be operated atl at the content of the provided with a section which may be reciprocated insightwise when shaking down most part of the grate is provided with a section which may be reciprocated insightwise when shaking down the fire of the party of the provided with a section which may be reciprocated in grate and it is morely necessary to the fire of the provided with a section with the provided with the state of the provided with the state of the provided with the states of the sub-rowed of the provided with the states of the sub-rowed of the states and the sub-rowed of the states of the sub-rowed of the sub-rowe

constant of the safer cooled bother shell. Most of the chart supplied to the furnace centry the side admis-furnt supplied to the furnace centry the side admis-furnace to requisite the in take of the furnace constant to the furnace of two bellers of 50 and 60 horse-power responsively. The save boilier on the usual rating of greats area to the and fine save should have generated about 16 the and fine save should have generated about 16 the and fine save should have generated about 16 the safety of the safety of

and we are spinginged that & 1 Window Spinging and because The private particular plants for \$0 and \$1 and

A Neved Review day.

A Neved Review day.

At the secent Congress of German Agreement of Prankitest on the Main, Dr W von Challements Repossibility or September 20 communication on the New York of the Company toward the proteins of a new bullion gas it wertical retors to relied in correct contract of the New York of Y ratio of 1000/1050 to the lifting power of hydrogen This would mean that h balloon of a ospecity of 1000 cubic meters would be able to lift 100 thingrammes more than a balloon of the same capacity filled with coal gas, or

else the size of a bal-loon with the same lifting power could be reduced by 30 per

cent.
This balloon gas contains noward of 80 per cent of hydrogen while the content of methane which was the most difficult to decompose is reduced 5 to 7 per cent. The gas has only a very slight odor which is likely to prove very convenient to person in the case of free balloons with open charging tubes, Furthermore gers in the case free balloons open charging tubes.
Furthermore it con
tains neither bennol
nor any other heavy
hydrocarbon capable
of attacking the balloon cover. The theo-

of attaching displayed of the control of the contro

The Washington Aquesinet either forty-six years of service in it escaled an activities according to the last samular leport of lafety Taylor Service, or the United States Corps of Engineers of Taylor Service, or the United States Corps of Engineers of Taylor Service of States of Engineers of States of Engineers of Eng

According to the Railroad Age Gassele, to Railroy which presently equalyzed Entiry to Sanctive to bear 28th has been visible to surprise the first and has been tempted and the sanctive to bear on the sanctive to the sancti

CURIOSITIES OF SCIENCE AND INVENTION

The transment on detactions all whoseseness rances the method of carrying persons who are the method of carrying persons who are the method of carrying persons who are the method of the method of the secondary and the Fire Department. Ordinaries used the Minds was in turned free downward and the Minds who was the transment of the method con stein of throwing the burden serous the heads or on the section. The right thigh and right upper arm of the man that is being courted are prisped between the fremans arms and bedy slows to the armpite This leaves the freezens and both legs free Formerly the fireman had the use of but one hand and arm making it a difficult matter to carry a victim down a scaling indeer femily matter to carry a victim form a scaling indder With the new method the weight of the burden is set to supported in a position where a maximum load can be carried with minimum eartism. The one that it respects if in a position where a maximum load can be carried with minimum eartism. The one that it respected in firmly locked on the itemans a shoulder by the powerful muscles of the shoulders and upper arraw. With both frequents and hands free the firm and one carry a burden down a vertical indeer without changer of Juliag and can even side down a vertical indeer the contract of the contract with firmly provided the contract with minimum whose work at one of the emergency hospitals of this city has brought him too contact with firmly and others indured at firms the New York Pire Depart

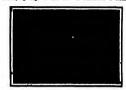
How long did it take you to make them? I in

"Time" Oh den t mention it I didn t dare keep any record —Edward F Bisslew

A VACUUM CLEANER FOR CLEANING STREETS.

A VAUVEM CHANTES FOR CHANTES STREETS.
The war eagland dust which is now as successfully waged in houses by means of vacuum cleaning run actions should undoubtedly be extended to in lude street cleaning. It is just as important to keep the distance of the street cleaning. It is just as important to keep the city of the control of the control of the control of the control of the city of the control of the cont where the nexter parts of the retuse are extra ted and deposited in closed receptacies. The fine dust which it has been impossible for mechanical sweepers as heretofore devised to dispose of in carried onward in closed conduits and we ted down so that it may be taken off in the form of silt

A curious motor ambulance for dogs is to be seen in the west end of London This ambulance is the property of the Animals Houpital and is used for aveying dogs to and fro It re



MOTOR AWBULANCE WAR DOOR

Ark in shape and is drawn by a lhorse-power motor yee to which it is atta hed by means of an ingustious coupling device which prevents the ambu lance overturning when raveling around corner. The ambulance is mounted on easy opings is fitted with pacumatic tires and is well padded inside in order to utilizing which in Deling motor drawn it can do ong jo rawy expeditiously and stiling animals can be conveyed to the hospital and rested without delay

A HOVEL BRIDGE CONSTRUCTION

A NOVEL BAIDOR COMPANDATION As memorary bridge outstruction which appears to have o siderable meri was recently existence of the siderable meri was recently existence of the siderable meri was recently as the siderable siderab her ar "mg in the vi inity while he the rode O could be for used on it is any of rope, preferably wire 'The construction of the b idea will be maders odd by re-right hader ded of he iridge. A remaker which runs through the last compressional members of the bridge serves as a pirt for two more compressional members that are cen rs. y fulrented hereon. When the two compressional members have several around as included ompressional me here are swung around as indicated by the arrows the tie rod is drawn taut and serves to take its share of the load. In building up a bridge of this sort the o ter and o tid be supported on a boat or tout you while the engineers were adding the successive pairs of members to the shore end of the bridge until a sufficient span was produced to rea h across the s ream. The oustruction was designed particularly





GARRYING THE MAN DOWN A SCALING LANDER.

at is indebted for this new and practical method carrying an unconscious person

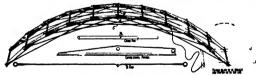
EXPERT GRAIF WEITTLING

EXPROY CRAIT WRITTLING

For several years I have been collecting specimens
of expert jacktante whitting Among those who have
contributed specimens is Mr George W Lockwood
Long Ridge Coan. About two years ago be supplied
to the several coanse of the several coanse of the several
table ball were Pri Rebert believe the collection. For the
I regarded them as the best in existence A little
that I obstante some triple chains from a Philadel
phie supert that slightly excelled those by Mr Lock
wood whose stendion was called to the Philadelphia
work Mr Lockwood determined to go him one bet
ever and the results were the two chains and cross
the "said the results were the two chains and cross
were also the results were the two chains and cross ter and the results were the two chalms and orns towers thereo hererith These are by far better than hay others I have been able to obtain. But chain in from a piece of word of prometick shape the cutting without break and does with an originary jack without break and does with an originary jack which The nested hourgians sections are expectably private and shiftlingly done. The linear games turn lighty in sets or sections. As will be readily seen a links are yennestrically shaped and well insisted



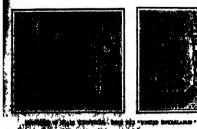
whi h propels the much ne tile pow r f tile exh e being utilized in the process of separating and relu By actual tests recently made near the n



HOVEL TEMPORARY BRIDGE COMSTRUCTION

me enditions this sweeper has shown its ability to an in an hour as much stree s rin e as the old bioned horse-drawn sweeper will sweep or brush in hours

for se in reinfor ing a on rete arch this way the ompressional bars ould be placed at the utside and after the concrete i ad set they could be removed for use in building the next arch.





VACSUUS GLEANER FOR GLEANING STREETS.

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RECENTLY PATERTED INVESTIGATE.

NORTHY PATHETON INVESTIGATION.

Pertaining to Appears.

NUTLE-ARTHNIER AND COLLAR.

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of the pronounce by come means.

Of theirward to Furneers.
IAMAING PRISSES.—I W Bourses. Ja.
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operator making the spile.

APRING TOTAL CLATVATOR — G. G.

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the 1ype that presents excess here to which
the spiring text for howe are attached. By
adjusting the position of these hars the ar
response to the text is can be changed as desired. The adjusting mechanism will insure
that the laws will hold themselves perfectly
right is their different adjusted positions.

Of General Interest.

Of General Interest.

IVIAI-PARKET—II of Mircussia, New York, N Y The aim in this improvement is to profess a basiler sepecially adopted to be formed of foote, ratures or admits strong basiler for family for the formed of foote, ratures or admits strong basiler from the foote footen foote

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GARTOROOFOR. M finanzana, Berlin,
Germany. This gastroncope competies a bortmostle and a veriles part. The latter when
festible lo costly introduced through a free
play late the toward, after which it is
straightened for the canazination. This part
on he turned through any native After or
feetible state, so that it can be stally drawn

Legal Notices

PATENTS

MUNH & CO., 361 Breadway, New Breach Office, 625 F St., Weskington,

INDEX OF INVENTIONS For which Letters Patent of the United States were issued for the Week Rading Jesusry 11, 1910,

AT DATE

AT DATE

The patents of the AND BACK BRARING THAT DATE [See note at end of list about copies of these patents.]

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Recent Poor Book D middle W MAMP IS S AND A 1987 P to 1997.

The most significant trophy of modern times. Warmed by the midnight sun and drenched in Warmed by the midnight sun and dreached in the fogs and snows of the Arctic, it has waved at the apex of the earth, where a day and a night are a year, and every direction is south. No battle flag was ever planted in the enemy's stronghold after struggles as severe as those which carried this banner to the goal. It is the Star Spangled symbol of courage and endurance and faith beyond comparison. It is the emblem of man's conquest over every obstacle, the triumph of spirit over matter

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possessions I ne magazine can be bought, but the flag cannot—like all priceless things, it can only be given away Read Peary's Own Story. Now appearing exclusively in Hampton's Magazine Every instalment is complete in itself. In the February number Peary tells about selecting the

their life and their strange customs, what they have meant to him, and what he has meant to them No one can understand what it means to discover the North Pole, unless he knows about these strange people who helped Peary to find it

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Vox Populi Vox Dese by Caspar Day is a nmor story of great charm and ingenuity

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Rvery mouth best about stories written by such well known men and women as Rez Basch lands of the Merton I year P Hopk non Suth Josephuse Daskam Bocca Mary K S Ardewes Mental Josephuse Daskam Bocca Mary K S Ardewes Reversed Gibbon Knopet Rugbes Wer Kaseffman Pavevel Gibbon Knopet Rugbes Mer R Wilkins Freeman Georgie W Paughorn Rille Parker Butter Arthar Stringer Catalian Face, Mary Heaton Vorse Lincoln Coloned Myra Kelly George Pricks and Loyd Osbourses

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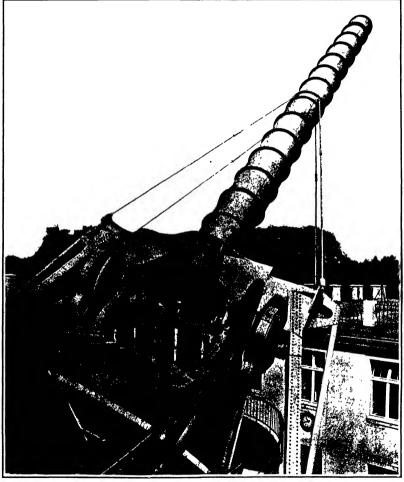
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coigs, one year to any feetige country posting, prepaid, bet 6d. e. III. S. (18.71). III. A. Michill. A. VI. III.I. (A. TOL.). A Midd. And row (a. Calabithed 1. Vel.). III. (A. TOL.). Shows a 10. 100 to 100

NEW YORK, SATURDAY JANUARY 29th, 1910

The killion is sirray a risal to receive for examination this straight on an objects of timely loterest. If the photographs are short, the articles about and the facts multipatter the contributions will receive special attention. Accepted articles will be paid for a regular space rates

WAVE VERSOS SHIP

A8 it e isst desputring protest of Old
Occan, when he lifted his gluut hend in
the blackness of the night of Jamery 10,
and smore the Lustiania' a how which
racked and splintered her lofty bridge and pilot house, 75 feet ubove the sea und crushed down her forecastle deck and decks beneath, giving them a permunent dapression of several inches? For time was, and not very long ago, when the me was the undisp no very long and, went the we was the undisjuted master of the shijt, and when ver Neptune saw it to open the visits of his wrath and send his langue-long rollers across the deep the proudest ship of the day must needs sing at his hidding if she did not luderd turn and run before the tury of the blast Of leto years, man, by virtue of his knowledge and mechanical skill, has been huilding in ever increasing lengths and breadths, and with such caseless en largements of bunker and boller room—he has so multiplied horse-power, and hus called to his sid so ingenious contrivuoces for speed and strugth and safety, that uid Neptune must for many a decade past here for seen the humilisting day when he could no longer hold the destinies of the bold sea voyager

no longer must and no longer say to him. Thus far, and thus slowly shalt thou go.

Following the litht of ultimate victory which was supplied by the "Lustianie" and "Campaulu," cam-that wonderful ship of the Hamburg American Line the "Deutschland," and the even larger and more powerful 'Kalser Wilbelm" and "Cecilie' of the powerful 'Kaiser Wilhelm' and 'Cecillic' of the North German Lloyd, and with the advent of each giant vessel, man a growing mastery of the ocean was above in ever forevasting speed, and a closer approxi-mation in times of departure and arrival to the requi-lative of transportation on isoda It was reserved for the steam turbino to supply the last mechanical device which was to give to tune

his age-long struggio with the elements a weapo in his age-tong attention to the combinetion of size of complete victory, for in the combinetion of size and sirength end power afforded by the latest turbine liners there has been developed a ship which has demonstrated its ability to drive at full speed and all day long into the heaviest seas that the stormy North Atlantic could pile across her path The writer will not soon forget a notable day some two winter will not soon forget a notable day some two winters ago, when the 'Lusitanie, in weather which varied from a gale to a full hurricane, averaged for twenty four hours a spred of between twenty-six end twenty four hours a speed of between twenty-six end teenty-se we land mitte an hour During the tunuit of that tremendoms struggle tenton enchors were shifted, it is true and steel derrik boors were saving attinuariship and twisted as if they were no stouter than a boys tim whistle. Yet the ship steamed into port practically intact and wi and with not e rivet

Ordinarily a transatisatic liner will drive her wey against a westerly gate vayage after voyage, with no e serious hart than the bending of a stan the breaking of a pane of glass in the idlot house But one in n long while there may come a combination of sens with here so related to the length o the ship that she may be riding down one were, her box burted deep and hor forecastle deck awash just as her seem drives hate a roller, steep of front and of west hight. Then it is that the structure of the ship macts its moment of supreme trial and not even the officers 75 feet above water, ore safe from the full impact of a solid Atlantic

sen. On the Monday night in question, because of the tempestuous westiter, the glass windows in the pilot includes the lowered and the storm windows built of solid wood with a small heavy glass port light in the center, tend been raused. The stern of the, ves-sel was lifting high on a recoding sea, and the fore-

castle deck was awash, just at the moment that a wave of gigantic proportions icomed up at the bow. From the fact that the solid water swept entirely From the fact that the solid water swept entiresty over the pitch house end the compass stand upon its roof, which latter is at least 80 feet above tha nor nel weterline, this wav must heve been some 35 feet high measured from the trough. The semwas breaking and therefore the mass of water must have had considerable forward momentum. The ship have and considerable toward momentum. The any itself was running at helf speed, end met the sea at a speed of from twelve to thirteen knots. When the mass struck the breastworks and pilot house, every mass struck the breastworks and pilot house, every one of the stont wooden storm windows was burst in, the woodwork being stripped clean to the sashes, end the stout steel framing between the windows was forced several inches into the pilot house. The sea ward, driving a piece of the woodwork be through a herdwood casing containing a portion of the firefighting esparatus. The quartermaster was borna back egainst the bulkhead behind, carrying in his hands the wheel which was torn from its stands. The mass of water then swept into the officers' we room and staterooms, filing them breast high with water—and this, be it remembered, at an elevation of 75 feet above the normal sea level

Now, since the entp is some 80 feet broad et this point, and the distance from the pilot house to the stem must be et least 150 feet, and since, in order to roll over the pilot house, the waves must have been some 35 feet in height, at least 4,000 tons of water must have swept over the forecastle deck—as enyor with a pen if and pad mey easily figure out for him self It cannot be possible that the wave fell with much vertical impect, or the decks would have crum piled up like an eggshell, but the momentum was sufficient in crush the forecestie deck and the three decks below a few inches down into the body of the ship, leaving them with a pornument set Drametic evidence of the enormous stresses to which the ship was subjected is efforded by the stanchions and solid steel bulkhouds below the deck, which, in some places, buckled out of the vertical as they yielded h meath the load above. Had the 'ludtania' not been built of special strength to stand such buffeting as this, the results night easily have been very serious indeed. the results night easily have been very serious indeed, and we ure infined to agree with her cagtefu in his belief that many smaller and less atomity built ships, which have disspecared utterly at see, may have been sent to the bottom by the crushing in of their decks under so-cailed tidal waves"

INDUSTRIAL PELLOWSHIPS IN UNIVERSITY WORK.

HE University of Kanses has inaugurated a system of industrial Fellowships, system of Thomas run removation, when a based upon a broadly similar practice that iss siready ben followed to some extent in Europe Some three years ago Prof Duncan of the Department of Industriel Chemistry directed the of-Department of Industrial Chemistry directed the situation of manufecturers to the necessity for greater technical efficiency, and suggested that this might be promoted if the manufaturing interests in the field of industrial chemistry compersated with the university of the contract of lished

A Fellowship for an investigation into the of laundering, with a view to saving laundered febrics, \$500 a year with 10 per cent of the profits. An investigation into the Chemistry of Baking estab-

lished by the Netionel Master Bakars' Asso with the object not only of improving the chemistry of bread but of providing for the association of a trained expert on whom they could thereafter rely, \$500 a year together with a sum to be settled by arbi-

An investigation into the relation betw properties of glass and its chemical constitution, \$1,500 a year end 10 per cent of the profits.

The discovery of new utilities for osono, \$2,000 a year and 10 per cent of the profits.

year size to be recent of the promise.

The general form of the agreement calls for an investigation to which the holder of the fellowship gives his whole time and attention, with the exception of three hours a week which he devotes to work of its struction in the Chomical Department of the University The Police, who is appointed by the chancellor and other officers of the university, must have a reputation other officers of the university, must have a reputation to research, must be a member of the university, must work under the direction and advise of the Professor of industrial Counsistry, and must forward through him to the industrial company, the decare of the his closely, periodical reports of the progress of the law of the processor of the his work. All discoveries made by the fellow during the tenury of the following the tenury of the following the tenury of the influstrial company, subject to the payment to the fellow of it per cent of the set profits. In the event of any discoveries made to the set of agreement between the donors and the holder, the chance lor of the university, or his appointee, is mu-

tually accepted as arbiter
The advantages accruing from these fellowships cording to Prof Duncan, are that the university gains increased opportunities for promoting research, that it obtains three hours a week of gratuitous and skilled instruction, that the manufacturer obtains the ad-vantages of vastly increased laboratory facilities and vantages of varity increased laboratory facilities and full library facilities (for lack of which factory re-search has been most seriously hampered in the past) that the manufacturer has consultative advantages, almoe the fellow appointed is et liberty to question specialists in the different fields of chemistry, that the specialists in the different news of elementy, that the manufacturer is freed from supervision of the work of research, and that on the termination of the fellowship s, if he se desires, the services of a man cated to this particular need. As researds the fellow, he co-operates in the advantages above ascribed to the manufacturer, he obtains an inside knowledge of facmanumeturer, he obtains an inside knowledge of fac-tory processes, end he is freed from the petty Inter-ferences and jealoustee of also employees and the "pot-shop" judgments of factory officials. Moreover, if he makes good, he obtains a pottion for which hei train-ing during the fellowahlp renders him peculiarly qual-tion.

Finally, since at the end of the three years' term ell work done under any fellowahip must be published free to the public, the latter becomes one of the most important beneficiaries of the new system. The insertion of this last (leuse was at first resisted by some itum or time sast (souse was at irst resisted by some of the menufecturers, but in the end the donor, when it was pointed out to him that a realty progressive magnifacturer would find that three years would give him a sufficient start of competitors, withdraw his objections

THE MOON AND RADIO-ACTIVITY

THE HOUSE AND RABINGAUETATE.

IE probable influence of the moon's movement upon the radio-activity of the air is brought out by M Paul Besson in a paper presented to the Académie des Sciences presented to the Auddmide des Sciences
We find that inferent authors show great varietions
in the radio-activity of the air and M. Bession
concludes that this radio-activity causes from the
ground, as Elster and delict also suppose. He medic
apprehensis in the summer of 1908 and 1909 and
aboved that the variation in the activity of inferral
the authority presents being. weter veried with the etmospheric pressure, being highest when the pressure inwered. Other authors ob-served the same fact. When the barometer descends served the same fact. When the barometer descends the emanation from the soil increases, and the contrary. But he noticed other variations which were ounted for, and thought that they might co unaccounted for, and thought that they might come from the tidd in movement of the earths crust, which was slown in a striking way by M Charles Lallemand of the Bursen of Longitudes When the moon passes the meridian it cause a tide! wave in the sarths crust, and the emanation from the soil is maximum at this moment, and vice verse, at least as may be empoosed. The anthor's observations feed to the foliowing conclusions. As regards etmospheric pressure-aione for a one-hour test which is constant with relaalone for a one-hour test which is constant with rela-tion to the moon's passage at the meridian and thus satisfied the moon's influence, the radio-activity in-creases when the atmospheric pressure decreases, as that et a constant barrometric pressure, the activity as that et a constant barrometric pressure, the activity and mustimum for the passage of the moon at the meridian and minimum for the passage at the other side. The author hopes to make a more complete series of ob-servations in order to establish his hypothesis. If the law of variation of the amenation coming from the earth could be established, we would ascertain the principal cause of the variation of the air's radio-activity Should it be found that the moon's movement cansed changes in the radio-activity of the air, we cannot changes in the ratioscrity of the air, we would here the proof that the moon has en infinence on the changes of weather, according to the popular belief, this being caused by multiplying or lessening the centers of condensation of water vapor, outside of air pressure offsets and others.

air pressure offects and others.

Mr T H Swelberg has succeeded in obtaining by ultra-richet radiations, collidate solutions of various results in different illegalet, The metal to be pulverised should be perfectly freed or any surface acid-fine basis covered with the solution in a fint bown, it is exposed from above to the redistance of human to the contract of t metals and solutions show a rather different behaping. Thus allver, copper, its and lead were found for he quite readily polyected colloidal existinae, whereas pictures, grantistens, and canfirms show only a very slight, if any, pulverisation. The other-installed control of the control of t

Scientific American

ENGINEEDING.

We tole that the Indiana State Railway Commission has recently issued an order requiring that all locomotives except those that are engaged in switching be equipped with headlights of not less than 1,500

A brain consisting of 130 coal care, each carrying 55 tons of ceal, was recently hauled a distance of 135 miles over the Virginian Railway in 8 bours, 11 minutes. The locomotive, which is of the Mallet type, weighed, with the tender 431,000 pounds, and the total weight of the train was therefore over 9,100 tons.

In view of the continual improvement which is tak ing place in the marins tertain the outlook for the early installation of the marine gas engine in ships of large power is not vary premising Perhaps the fature of the latter lies in the direction of small highspeed engines generating correct to be used on slowspeed engines generating correct to be used on slowspeed electric motors direct connected to the propeller shafts.

In the recent placing of a memorial window in Westminster Alboy to fit Beal, similar Baker, a fitting thick was paid to a great engineer and a procedent was established which in this age of teachical schivesame must meet with aniversal approval. The tablist readin Memory of 8ft Beal, sain Baker, (Ivil Beagineer, Forth Bridge, Assouan Dam, B 1846, D 1907 It is probable that the series of windows, of which is forms one, will be reserved for commemoration of other famous engineers.

The wenship has already surpassed the ocean liter in speed and she is rapidly overtaking her in size the nor British armored crulese. "Line" will be about 100 members of the property of the second of the property of the pr

The really extraordinary increase in the power of responsable applies due to utilizing the exhaust in a low pressure turbine will be understood when it is borne in mind that in expanding steam from any independent of pounds to a 38-inch vacuum, over 50 per cent of the power of the present of the reduction in temperature occur below atmospheric pressure, or any, from about one pound gauge to about one pound absolute it took the low-pressure steam turbine to recover the hast energy thus lost in he exhaust

We understand that the Rittish government is favorable to the construction of a ship canal across Socioland from the Firth of Forth by way of Silrilag, Lohama, and Local Long, to the Firth of Cityde Thopian proposed calls for 85 miles of take navigation. It is estimated that the work can be completed in its paras at an expenditure of about \$100,0000 if it the minimum depth of \$5 feet, and bottom within \$1.5 feet, with locks to match, the government will be prepared to cooperate with private omiterpies.

The improvement in readied, rolling stock and proctive signaling on American railroads is shown by the Bureau of Railway Naws of Chicago, whose stress show that 360 roads operating over 154,000 miles of railway have not killed a passenger during a period one year. It is true that toward the close of 1990 there was one of those curious spidenties of accidents which cast a shadow over this record, but the immunity mentioned above shows how wastly we have advanced vere consistions of two or fitness years ago

vances ver continuou of two fritters years ago A contract has been let for the removal of the fall operion of the Quabos Bridge which now like in a contract of the Quabos Bridge which now like in a contract propert the state in to be served for emoval by means of a mechanical cutter, but we do so place much residence in the statement, for the soon that the obviously ideal method would be to use soon that the obviously ideal method would be to the cary-bridgen or ory-actyrien fams, whose apparatus is so portable as to render it ideal for setting by in the many difficulty settlesses which would be asce-

Comparative tests of consolidation and Mallet locomoliyas over mountain grades on the Southern Facilia-Salivitys, under similar conditions of service, and historia under similar conditions of service, and historia under similar conditions of service, and present force the simple, high-preserve inconnective or the special conditions of the similar conditions of the salidation per sout those water per pound of finel, showed 14.04 per cost those water per pound of finel, showed 14.04 per cost those water per continue or to miles per pends of oil branch, and housance of the grades size and power health? 18.24 per coint more tomage, The occampy in due to the be-bidsing of the standting of the feed water, shift computating. The rebutted can force water large terms of the size of the healting of the feed water, shift computating. The rebutted can force water large released the mandamant, tangesparance of the points from 78.5 degrees in the lighting single to 48.85 degrees for the ballet type,

ELECTRICITY

Among the most important advantages of the "Paya-aryon-easier" car is the fact that these cars are mafer to passengers getting on and off and fewer acrediant occur from persons asseling roll gains Statistics have been compiled for the Chicago real-roads which above that aline. "Paya-aryon-enter" cars were installed the number of accidents has been reduced 519 per own.

duoed 319 per cent.

A recent report of the American Telephons and Telegraph Company above that at the end of 1995 the Bell companies owned 3,50,000 telephones, while 1,500,000 were swead by companies under contract agreements with the associated Bell companies. This is an increase of 600,000 telephones during the year The ayrience comprises 1,05,50,000 miles of twice, 400,000 miles of which were added last year Half of the total mileage is underground

A test of Thomas A. Editone storage buttery our was recently made at West Orange, N. J. Th. our is 28 feet long and weights tosses. It was fitted with two 'Hyborsepower motors, and the operating cost is estimated at one cent a mile. During the test, the car was operated at 16 yeology and the period of the car was operated at 16 yeology, and it is claimed that a run of 160 miles can be made without recharging the latteries.

It has been reported that the lillingia Tunnel Company of Chicago is about to establish a year company of Chicago is about to establish a year competition with the present ties competition with the present tiesphone system to the rity. The new system will anake connections with long-sixtance independent lines. The Tunnel Chicago and the properties of the properties. The properties of the

Metal diseases hange are new being used on abligand realized cast. Sinch new were considered impossible a few years ago owing to the frailty of the long file amont required in these lange, and it was supposed at the time that they could never be used anywhere the control of the design of the second of the sec

At a recess meeting of the New York Electrical Solvity one of the speakers, lecturing on the subject of domestic electricity. Prictred to a certain boson that had been designed to be heated and lightic by electricity alone. The boson contains no rhim veys actives or coal storage room, and the saving in these requirements of the usual coal heating system was sufficient to pay for the entire electrical installation in regions where the cost of coal is light and water prover in plentital electric heating and lighting is no

One of our largo olectric illiminating companishas found a new field for the consumption of civricity, mannly, the chibren leandery. A Chiannam was induced to cattly his shop with an olectric nashing machine and electric froma, and the photograph of this enter prising foriental with his chectrically cauthpead shop is being sent around among Chinese laundrymen, together with a letter writton in Chinese calling sent into not the advantages of modern methods in the laundry business It will be introveling to watch the success of this experiment.

A carwally tabulated record of the cost of electric wagons and horse rigs used by the Commonwealth Edition Company of Chicago has just been published it shows conclusively that the electrically operated wagon is cheaper than the horse drawn rebilies and when was did to this advantage her fact that it makes a better appearance, it handler, and can cover ground electrically operated wagon in far superira to the horse drawn white and will undoubledly displace it. Attention should also be called to the fact that the cost of the horse drawn risk in increasing each year; particularly because of the risk of the type of the contraction of t

ticularly because of the rise in the price of reed.

A funder-term observatory has been established in Spain by Senor G J de Guillen Gargia. It is a summer of the control of the control

SCIENCE

Lieut. Ernest H. Schackleton has announced that he will enter upon another Antarctic expedition. The date of the expedition has not as yet been decided.

The Brooklys Public Library has published a littio pamphiet on "Aeronauties or Aerial Varigation, which comprises a list of books and references to periodicals in the Brooklys Public Library on the subject of seronauties "The list is fairly complete, and may be regarded as an excellent bibliography of a most timely subject.

A tyramosaurus has been piaced on exhibition in the Dinosaur Hall of the American Museum of Nat until History. This dinosaur measures 60 feet in length The jaws of the massive shill are four feet long and are armed with sharply pointed feeth. Tyramosaurus was probably the largest caralyorous animal that ever reamed the extension of the control of the control of the reamed the extension of the control of the

The Boott expedition in search of the Bouth Pole is now assume. The Drillis sovermann he promised \$100,000 (oward the \$200,000 which is the entire System A cotal of became flower of the entire system and \$000 has been raised by public subscription in all illustifiest of the expedition will seart in July. Soott commanded the British Arctic expedition of 100-1904 Blackfiction was one of this listentants.

Many attempts have been made to use old newspapers and other printed sheets in the manufacture of white paper, but the removal of the printer lisk from the fiber line with larger lisk from the fiber line with listen provided an inneparable difficulty. In a process recently pattent of in Germany the paper pull is treated with shkaline solutions of percently of the other lines which so after the grown part of the link that it causes to bind the lamphiles had other pigments, which are then easily separated from the fiber by emultifying the pully with delations sillen.

emulativing the pup with feetations silice. An international agreement for the probibition of the use of saccharine has ben instituted by the Truch government. Favorable responses were received from Germany, Austria Hungary Helglung Greece, Italy, hos Nehr-inade, Portugal, Russia and Switzerland, and a meeting of delegates from these countries was held in Paris, under the presidence countries was held in Paris, under the president of the Parish of the Parish Countries was been deep to the Parish the session on November 18th with a son closed its session on November 18th with adoption of a formal prehibition of the use of any harden in the probabilities of the use of any harden in Good and her rages. The Francis governments of the other countries for ratifications.

A recent German patint describes the preparation of a casting mass composed of sisked line and water, with small quantities of alkali and a carbohydrate too paris of a sitt past of owich-laked line, containing approximately equal amounts of line and water, see mixed with 1 or 2 parts of a carbohydrate free from water such as guns arable, dextrin or supar, and are qual quantity of a potable or soda sait while is decomposed by line. The mixture becomes as fluid as if a large quantity of water into been added to the line, but soon collidities and relative the form of any model into which it is poured it fabout 2 parts of reliation world upon the control of the property of the control of the

The Investigation of the spectra of the plants, which was began at Lovell Observatory to 1938, has been confined. The result of result work is given been confined. The result of result work is given found a combination of dyes which modern the mean three the confined and the plants of the plants and the plants are plants and the plants and the plants and the plants are plants are plants and the plants are plants are plants are plants and the plants are plants are plants are plants are plants and

a minute to minute and accumentative or inscorred plants. The ord garden varieties furnish suvey table plants. The ord garden varieties furnish suvey table of the property of the property of the principal sources of sugar and alreado. The un full was of the valuable root has now been increased by the production of an edible flour from sugar book. The dependent of all the production of alled a super book of Claukenrehultzeli is already practiced in Germany on a very extensive scale but the product is employed accinately as for an about from dried beets which, seconding to a paster and before the recent chemical congress in London to enlirsly free from the distinctive flavor of the best and is suitable for use in making cakes, puddings, and pastry As it contains about 65 per cent of sugar it can often be substituted, with advantage, for sugar, in somewhat larger quantities. The processor of the cannot be substituted, with creat less all the succession and gradient not only creat less than the or traction of sugar, but preserve at the sugar of the traction of sugar, but preserve at the sugar of the traction of sugar, but preserve at the sugar of the form of molasses,

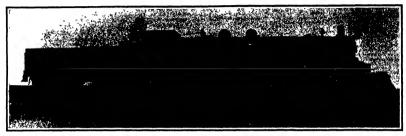
A NEW ERA OF THE AMERICAN LOCOMOTIVE

TWO REMARKABLE ENGINES

It is not stretching the point too far to say that the design of the locomotives herewith illustrated, one for passenger and the other for freight service, marks a new era in the development of the American steam locomotive. This is particularly true of the passen

This has been done in both engines by utilizing the great length of boiler space afforded by the articulated system of construction. As will be seen from our sectional view, the boiler proper terminates above the high-pressure cylinders. The shell, however, is ex

the high-pressure to the low-pressure cylinders, the heat so taken up by the steam serving in each case to raise the heat energy of the latter Finally the gases pass through a large nest of tubes, around which the feed water is caused to circulate and is raised to the



Wright of engine and tender, 35 too. Tractive force, 35; too. Scaling carriers, 4.75 squar-for. Stoom pressure, 30 points imperhenting and reheating surface, 1.21 squar-less, 1.21 square, 1.22 square, 1.22 square, 1.22 square, 1.22 square, 1.22 square, 2.22 square The most powerful passenger lecomotive in existence.- A new type

ger locomotive, with which, by the introduction of the Mailet articulated piston, it has become possible to haul heavy fast massenger trains which with the preshaul heavy fast passenger trains which with the present type of locomotive, it is necessary to run in two actions. Moreover, so powerful is this ongine that it can haul over the heavy grades of the mountain divisions trains-continental trains which at present call

for the assistance of an extra locomotive
The Mallet articulated freight tocomotive is

familiar but the tion of the truly mammeth affair recently hulit for the Banta Fe Railroad based on liv great weight of 850 tons and its tractive force of which figures greatly exceed previous freight locomotive Both locomotives were built hy

the Baldwin Lostive Works for the Atchison & Santa Fe Rail

road The most important novelty, common to both en-gines, and the one which marks a distinctly new era gines, and the one which makes a distinctly new era-in locomotive practice in this country, lies in the means which have been taken to transform the loco-motive from one of the most wasteful into a reason ably economical power plant (if we may use the term)

tended forward to the low-pressure critinders, and within it are placed two nests of fire tubes, through both of which the hot gases pass on their way to the smokestack. The first of these is divided by a dis-pragm into a super-hestor and a re-heater, the second forms the ford water heater

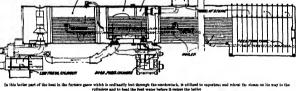
Now, in the ordinary iccomotive the gases, still very hot, after emerging from the front end of the fire tube, pass out through the sn

boiling point, as it travels from the tank on the tender The advantages of this system are that not only is

a much larger percentage of the heat energy of the fuel turned into useful work, but the superheating and re-heating enable the well known economies of compounding to be realised to the fullest extent, a consequence the coal consumption per ton mile has been reduced by approximately fifty per cent, ten per cent of which

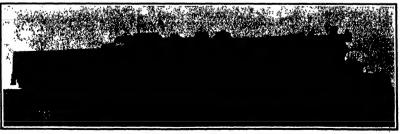
cent of which is estimated to be dus to super-heating and re-heating, fifteen per cent to feed water heating, rnd twenty-five per cent to com-pounding These present merely

we see no res son why, with proper fring and intelligent handling of the throttle these should not be realised in actual service. The Santa Fo passenger incomotive embedies the first attempt apply the actualed system to passenger surject to proportions are scoronous, far exceeding any existing passenger sorroutive eithor here or abroad. As far as cylinder and driving wheel arrangements are concerned, the engine is practically a combination of the (Consinued on page 123)



The new boiler which saves 25 per cent of fuel

ant of useful heat into the atmosphere The Santa Fe locomotives return a large part of this heat to the boiler and engine Referring to the diagram, it will be noticed that those heat recovery diagram, it will be noticed that those heat recovery devices first serve to raise the temperature of the steam as it passes from the steam dome to the high pressure cylinder. Then the gases yield up still more



Woight of engine and tender, 20 ton. Tractive force, is ton. Heating surface, is upon lest, Steam pressure, 20 pands. Superheating and redocting surface, is feel. Cylinders: Two high pressure, 30 inches by 81 inches, 100 inches, and engineering, minutes, and engineering, and engineering engineering engineering. The most powerful lecemetive. Weight, 850 tons.

A NEW REA OF THE AMERICAN LACOROTIVE.

PUTTING OLD NEPTUNE TO WORK

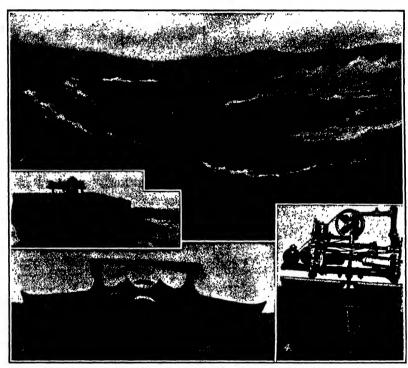
Twice each day millions of tons of shipping in New York Harbor are litted to a beight of over four feet and dropped the same distance by the title This same work is done in every port to a greater or leas degree. Many a man has eaviously considered this normous acceptaliture of power and racked his brains cnormous expanditure of power and racked his brains for a means of putting it to valuable service. How ever, the work done by the tides is enormous only be-cause of its vast extent and herein lies the delusion which many an inventor has failed to discover until which many an inventor has failed to discover until the has devoted much thought and time on evolving a tide motor. The work done in raising of the "Lusi tania," for instance, which weighs 40,000 tons, repre-sents an expenditure of energy of only sixteen horse-sents an expenditure of energy of only sixteen horse-

is utilised to operate a series of pistons pumping air into a compressed air tank. The compressed air tank and four pairs of criinders are mounted on the main and four pairs of orlinders are mounted on the main fact. The plate not are consocied at their outer ends to the four fosts and when these fosts are rocked by the waves they serve to reciprocate the pisions and pump the air. This action takes place regardless of the direction is which the waves are travelling because the savillitary floats extend in four directions. As entirely different method to utilising the force of the waves is shown in Fig. This commission of a large or places are the savillary floats extends to the con-

that the waves will wash up over the floor of the crih as they do on an ocean beach. At the back of the crib

rock to and fro the pinion is rotated first in one direction and then the other, and this motion serves to map all rise a task. The air from the tank operation a pneumatic motor which in turn drives a dynamo and generate electricity in order to peralt the finist to sating about it any direction without dange of fooling the anchor limite one of the fiduct is mounted on a awivel which is securely anchored. By means of con-tact wheels engaging contact rings on the swivel the electricity generated is conveyed to a pair of cables

electricity generated is conveyed to a pair of cables within extend to the shore. The construction shown in Fig. 4 depends for its operation on an entirely different principle. It is well known that the wave disturbance of the ocean does



Four movel methods of utilizing the power of the waves,

PUTTING OLD MEPTURE TO WORK

power, this being due to the fact that the tide acts very slowly, taking six hours to raise the vessel to a height of four feet.

However, there is another form of energy displayed by the oeas which is for more powerful than they the oeas which is for more powerful than they the oeas which is for more powerful than they for explaining a portion of this belt, and here there appears to be more opportunity for containing a portion of this power and device they developed its by most powerful than the second that the content they develop entirely to much energy and are said to wreck his machine. The accompanying engineering the limit of the content of the co However, there is another form of energy displayed

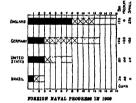
are a pair of curved deflecting walls before which is are a pair of curved defecting walls before which is a placed a triangular casting provided with a series of swinging doors or vanes. When the wave wash up-the floor of the erfb hey does the wanes against the easing and divided by the prove of the casting are di-rected against the defecting walls. The rear of the triangular casting is opered, permitting the water to five through as the wave receive and strike against the war faces of the wares opening them to the posi-tion shown in the litheration. The wanes are servertion shown in the illustration. The ranse are geared to a series of pictum rods which owerstic the rylinders to fill in compressed air chamber. The latter, by mean of a pair of air motion operations a dynamo and generates electricity which may be conveyed to any desired spot and utilized. Fig. 2 shows a construction similar to Fig. 1, making see of the recting of two floats. The floats are hinged to such other and one curries ruch adapted to estimate a phasics misconicé on the other float. As the floats

not extend to any great depth and it is the relative moto carear to any great sepan and it is the restrict motion of the surface water with respect to the water at a considerable depth that is unde use of in this case to generate power. A final te provided from the center of which projects a shaft fitted at its lower end with a set of radial flux. When the float is rocked by the waves the shaft tends to remain vertical owing to these fins Mounted on the float are a series of cylin ders provided with the usual pistons which are con ders provided with the usual pistons which are con-nected to an extension of the vertical shaft just re-ferred to, and while the pistons remain virtually fixed the cylinders are recliprocated upon them by the rock-ing of the float. The pistons serve to trivilate oil through a rotary engine which in turn drives a dyon me and thus generates electricity. When the wave When the wave motion becomes too violent an electrically-operated by passing through the motor and thus an excessive speed

PORRIGH WAVAL PROGRESS IN 1908. ------

During the year just closed considerable navai activprincipal dayal powers adopted large programmes of new construction and made good progress with those already in zaletane, but the niluor powers have shown in a practical manner has a "" rought fever has taken on the mind of the world

Great Britain during 1909 has finished the last of the trio of battleship-ruleers of the Invincible AMERICAN are already fully aware through the appear ance of the 'infaxible' at the liudson Fullon relebra The three battleships of the 1906-7 programme ficilerophon,' Temeraire' and "Superh"-the like rephon.' Teneratics' and "Buperh"—
have all been passed into service. They are of 18,000
tons, 700 more than the "Dreadnought," but differ in having sixteen 4 inch 31 pounders for their antitorpede armament as compared with twenty-four 12 pounders The end of the year saw also the completion of the battleship Vanguard, of the 1907-8 pro-gramme which was turned out by Vickers, Sons & remnine which was turned out by remain, bowed the Maxim in the record time for any ship since the Treastrought herself, of 19 months. The "St Vin Urraduougnt bersett, or 19 months for 3 viii cent and Collingwood compileting the 1907 8 trio, will be commissioned this spring. All are of 19,250 tons, and have ten 12 inch 50-caliber guns (the main armament of the others is 45 calibers; and twenty 4 inch rapid fire weapons. The thickness of the main by it is reduced to 9% inches in these ships compared with it inches in the earlier vessels, but a larger area of the hull is protected by thick armor. Other area or the null is protected by thick armor Other vessels passed into service during the year include the unsumored trulser 'Hundleck,' or 2300 tons and 25 knots, designed to act as mother ship' to the destroyer follilas, a number of 33 knot destroyers khots, designed to are as motter supp to use de-stroyer folliths, a number of 33 knot destroyers-"Afridi" (which had to ix accepted at 1276 knots) "C'rusadar," "Amsson" Saracen," "Maori, "Yiking," and 'Zulir A new lyie of submarito has been com-pleted. This is the 13" of 600 tons, which showed



ed submerged. She is fitted with twin

scrows, and has a steaming radius of 4,000 miles.

The vessels launched during the year are the bat tieship "Neptune," of 20 250 ions, with the same arms ment as the earlier Dreadnoughts, but so arranged that there is a broadside of the whole ten beary guas, and the structured cruters "Indeatingship," 19,000 tons, carrying the same battery as the "Invincibus," but longer, enabling a wider are on atther beam to be covered by the whole olghi 12 inch guas A number of small crutsers and destroyers have also been tours hed

Three new battleships have been commenced. They are the "Hercules," "Volossus," and "Orion," of the same displacement as the "Neptane," had with the fire 12 linch gus lurrets arranged arisally. The syncord cruiser Lion, also laid down will be of 25,000 tons and 3% to 29 knots, and will carry ten 15 linch guas

Germany has had a record year in naval construc-tion 8he has completed her first two Dreadnoughts, the "Nassau" and "Westfalen," of 18,500 tona and armed with twelve 11 inch and twelve 59-luch guns Both ships exceeded 20 5 knots on trial, although de-Both ships exceeded 20 6 knots on trial, attnough de-signed for 195. The armored cruiser "Blucker" has been commissioned as flagship of the High Sea Floots cruiser squadron. This vessel cannot rank with the liritish 'invincibles, but as is nevertheless a powerful ship, displacing 15,500 tons and steaming 245 knots on Irial Her armament consists of twelve 8.2 inch and eight 59 inch guns, and her main belt is 8 inches thick The battleship "Rheinland," sister to inches thick. The battlesnip "musicum, the "Nassau" is now running her trials, and the "Po-

em will follow this apring

Five large battlesbips have taken the water during the year Three of these are battleships—the "Ost friesland" "Thuringen," and "Helzoland," each of friesland." Thuringen," and "Helgoland," each of 20,000 tons. They are the first German ships to be armed with 12 inch guns. Krupp's having built a 50-caliber weapon firing a 981 pound abell. Twelve of these guns will be carried as well as a similar num-ber of 6.7 inch—In armament at least, therefore, these ships will be greatly auperior to any British ship yet launched. The armored cruiser "Von der Tann" has also been launched. She is of 18,760 tons and will steam 25 knots, her armament comprising ten 114nch and a secondary battery, it is believed, of 59-inch guns. The cruiser "Q," following toward the close of the year, is a sister ship

the year, is a sister ship
Two small proisers, the "Kotherg" and "Mains," have
been completed. They are of 3,800 tons, earry fourtien 4 linch guns, and sistemed 27 to 28 khots on
tris! The completion of destroyers continues a factor of naval strongth in which Gormany loads the
world Her twice vessels of the 1908 programme are

world Her twelve vessels of the 1905 programms are in commission at a time when those of the British programme for the same year are only being launched Three battleships have been said down, similar to the "Helpoland," but equipped with turbines. They are the "Ersats Frithjof," "Ersats Hildebrand," and are the "Ereats Frithjof," "Ereats Hildsbrand," and 'Ereats Heimdali" The armored cruiser "H," of the 1809 programme, was laid down in December, 1808, in advance of the orthodox date. Two more small cruisers, twoive destroyers and some submarines have n laid down

auso neen haid down All the French battleships of the "Danton" class have now been launched They are of 18,400 tons and will carry four 13-inch and twelvo 94-inch guns. Adwill carry four 13-lnch and twelve 94-lnch guna. Admiral Bous of LaPeyrore, the new Minister of Marine, has done much for the benefit of the naval service. The next ahips to be ladd down, two of which will be started at once, will be of 23,400 tens and will carry twelve 12-inch and eighteen 55-inch guns.

A start has been made in the re-creation of the Rus sian navy, and four natitudings were laid down at the Raility pards on Jene 14th hat, where they will be built under the supervision of the British firm of John Foren & Co. Their names are "Gangut," "Revision of the British firm of John Brown & Co. Their names are "Gangut," "Revision of the British and attom 47. The designed useed is 33 moia. The two Riske See subtiships "Ander Percursarial" and "Importate Pavol I" have been completed, as well as the small armorder cruster "Fallingh," 5,500 mos. The former are 17,500-ton vessels, carpying four 19-int the first has deventy when the state of the supervision of the s dan navy, and four battleships were laid down at the

armed with tweive 12-inch, ten 6-inch and tweive 47 inch guns The "Batsuma," iaid down in 1905, has been passed into service Displacing 19,250 tons, she carries four 12 luch, twelve 10-luch and twelve 6-inch guns Much difficulty is found in turning out ord nance fast enough to supply new ships, and the arm ored cruisers "lbuki" and "Kurama," laid down in 1905, are still delayed by this cause Two new cruis-ers, the 'Huki' and "B" have been laid down. On 18,650 tons they will carry six 12 inch and fourte 6-inch guns, and steam 25 knots

6-linch guns, and atsam 25 knots Among the lesser powers ltaly has isld down four large ships. The "Dante Alighier! and 'Cavour' isles "Leonaried at Vincit" will carry tewler 12 inch, and the "Michael Angelo" and "Galliec-Gallish," it is reported, eight 4 linch Austria has leuvehul to her half believed to the her half with the half which has been overeal as soon as financial difficulties have been overeal as soon as financial difficulties have been overeal as soon as financial difficulties have been over come The first of the three Spanish ships, the "Es pana." has been communed, and will carry eight 12pana," has been commenced, and will carry sight 13-inch gues on such a low displacement as 14,760 tons. The Brustlian "Minns Gerace," with twaive 12-inch has been completed, the "Sao Paolo" is nearly ready for trials, and the "Rio de Janeiro" has recently been tor trian, and the "Rio de Janeiro has recently seen laid down The Argentine is going to have two battieships bniit, and Chile one A Chinese navai commission is touring Europe with the ultimate object of placing orders for three 15,000-ton ships; Turkey has sent Admiral Gamble back to England with in nesses Aumira dambie back to England with in structions as to the ordering of two battleships, and Greece has allotted five million dollars for the pur-chase of an armored ship from an Italian firm.

HOW AN AMATRUR MAY FIND HALLEY'S COMMIT.

BY MRY AUG. W RORMYS.

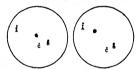
Thinking it a laudable ambition to be the first amateur to find Halley's comet, I have been working with teur to find Halley's conset. I have been working with my 34-jinch tekeopo for several weeks trying to locate it. I have not tearned as yet that I am the first, but being confident that I have succeeded in finding it. I have thought that other annatours suight little to know how it might be done filese the easy method here described may also be employed by handstern in other stupies storline of the beyond, I have gone somewhat mits details. Despite the fact that ones extraordinate of the control journals have said that it would be some time before the comet in question could be seen in a small telescope. I have the word of a prominent astronomer that it can now be seen in even a 5-inch-provided, of course, one knows where to direct his

So the first problem is to sacertain the position of he comet. There are very few amateurs who have alsecopes mounted with circles. Hence we must

adopt a plan that will enable us to find it with-out such aids. Of course it would he air easy task be locate it if one hast all the equipment of an observa-tory, mersly by setting the telescope in the proper right accounter and declination.

Now it we will turn to the recent files of the Semi-rope of Assession, we may find the right assession and declination given for every other day during January and Pelveary. The data for the intermediate days and be easily deduced by making last the difference of any two alternatic days and adding it to the residing to the substantial of the second of the contraction of the property of the second of the second of the con-traction of the second of the second of the second attacks should be one of the first books owned by an anasteur Almost any good library can furnish you with such an atlast if one is not already at hand. Then with the ophemeric before you follow the course of the somet from day to day by tracing the right se-cansion and decilization on the map. Note the day when the recidings first come near to some prominent star This will be the time to put the methed to trill be in order to have acately how mere the conset will be w if we will turn to the recent files of the figure star I fins will see that time to put the method to trial. In order to know startly how near the comet will be to the star, consult the Nantical Almanae or any other source accessible to find the R. A. and Dec. of the star Upton or other star atlesses will give the data for

ome of the stars.
By this process I found that on the even By this process I found that on the eventing of No-vember 30th the cornet was to be near Adelebrata in Taurus, so I began in good season to make my trial The evening before I made four carefully constructed charts of the stars visible in my field of view I is used my 4-f-power expelse, and this meant about to minutes or 47 minutes of are, in the field. Upton on page 14 gives the R A of Adelebratan as 4 to 10 min, and the Duc as + 16 degrees 19 min. The R. A. of the content on this day was 4 ter 30 min, and the Dec, + 15 degrees 56 min. The R A is the same, and the Dec place II to the south of Adelebrata The would bring it within the field of view of the telescope. One can estimate quite accurately the number of minutes of arc within the field of view of the teles sighting it upon some object whose size is known. To moon is suitable for the smaller powers it is



6 P. M central standard 11 P. M. central standard time. Jan. 14th, 1910 time Jan. 14th, 1910.

A is a small double star, B is a star of the 8th magnitude; C is a very dim star the collection of dots is Halley's count.

min of arc in diameter Epsilon Lyrses may be used for the higher powers. The two principal stars of this for the higher powers. The two principal stars of this double (in reality a quadruple star) are 3 min apart. My 300-power presents a field of vision of about 6 or 7 min. Now if the point axis of the tolescope is pointed exactly to Polaris, it would be necessary only to make one map of the desired area and estimate the 28 min distance to the south I had my theseope, on this particular seroina, directed from a story window and was not sure of my exact second-nory window and was not sure of my exact polar location, so I drew the four maps, hoying to be more certain of incinding the comet within the list. In making such observations and trying for a definite location north or south, saft or west, one must hear in mind the fact that an astronomical telescope inverts the object. A little study with the moon, which can the conject. A little study with the moon, which can also be observed with the naked eya, will help to straighten out this matter. Now after making these four maps on the evening of the 29th, I planned to rour maps on the evening or the 29th, I planned to observe carefully the next evening to see if I had any object in view not viewed the night before. But the evening of the 39th was dimly illuminated by the comweening of the start was clearly illuminated by the com-ing rising of the moon, while the second eventus was much darker, and I found many new stars in view While i had thus planned to locate the count by a process of addition (and this while have been the process of addition (and this whole have been the more destrible as it would have apachted a more car-more destrible as it would have apachted a more car-ful scrutinty) I decided to look for it the next questing by a process of estimatation is on the svensing of the side of the contraction of the contraction of the same areas like those shown in the engraving and made about two weaks ago. Something like withy or ex-city stars appear in the corts. After prevent evening one star on the suppe failed to appear gants, I find-cated this position by a small erice. So I concluded that this was the comet. I have since worling it by a statch translation as by a premianted astronogenes deli-stration of the contraction of the contraction of the contraction of the position of (Dhisteases on pages 125.)

Scientific American

THE LAST WASHINGTON CAPAL.

A public work of much importance, though not wishly known, is the proposed canal connecting the tidal waters of Puget Sound with the fresh water lakes, Union and Washington, Jving in or adjacent to the city of Senttle, Wash. The project is a very old one, though it has yet progressed to further than the acquirement of right-of-way, the formal adoption of a project by the War Department and its submission to Congress, and certain local messures now in progress for the raising of funds to sid the government in the

e canal is to be a joint enterprise, to the The canal is to be a joint enterprise, to the cost of which the government and the local commonity will stimately contribute about equal shares. The local community has already acquired and delivered to the United States the right-of-way, costing about \$250,000 in will assays the channel at a cost of about \$1,000.000 The railroads, street are companies and city will have to construct bridges and cost of about \$1,000.000 The railroads, street are companies and city will have to construct bridges and cost of about \$1,000.000 The government will be shall be constructed to the construction of the constr build the lock and controlling works and a power plant. It will also hulld the entrance works and take

pant. It will also build the entrance works and take care of certain other features of the project and will maintain and operate free of toil the completed work. The cost to the government will be about \$2,000,000 Pollowing are some of the benefits of this work which justify its construction and which also justify a division of the burden between the government and the local computity. It will be of great value to the navy by giving a

admirable fresh water waiting basin for vessels laid up in ordinary time of peace Puget Sound will al ways be an important naval rendesvous, and the Navy Yard is only 18 miles from the canal entrance.

It will give a much needed expansion to the harbon It will give a much needed expansion to the harbor facilities of Elliot Bay The practically available frontage on the Bay does not exceed 5 miles, and a large part of this is in the hands of the railroads. The opening of the lakes will give fully ten tin The opening of the lakes will give ruly ten times greater frontage than at present, and much of it better situated for public convenience. It will make accessible extensive sites suitable for manufacturing cetablishments. The areas at present available, where both rail and shipping facilities can be had, are extremely

The completion of the canal will give much The completion of the canal will give muon second anchorage grounds for shipping Many vossels are laid np during the winter, and owing to the excessive depth of water in Puget Sound, suitable anchorages are very scarce Not only will the lakes afford better prage grounds, but they are free from the destrucanohorage grounds, but they are free from the destruc-tive effects of marine life which is very active to the waters of the sound. The halls of vessels will entire much less destroyation than it and twater. Likewise subagnosus timber construction, which cannot be de-pended upon for more than a year in the sound va-less the timber is "treated," is practically impurita-ble in fresh water. The shallower depths also will be much less expensive for wharf construction and

The lakes are, of course, entirely free from tidel fluctuation, which on the sound has a mean range of 10 feet and an extreme range of 18 feet. The fixed level will be a great gain in all shipping operations.

The foregoing advantages are of a general character, but there are others of a purely local character that are very important.

that are very important.

The cost of arrayage in Sentile is large because of
the extremaly uneven topography of the city and tha
sheurce of good grades leading up from the present
water front. The canal will flank the hills, distribut
ringlet throughout the city and reduce the cost of
drayage, it is estimated, by 25 to 50 cents a ten. This
write will be a few years qual the local contribution to the cost of the canal.

The lowering of Lake Washington to the level of

Lake Union will drain all swamp areas around the shores of the lake, relieve the valley of Black and Duwamiah rivers of the floods of Cedar River by turning the latter stream directly into the lake, a mag too cases' acream circerty into the lake, and will make the whole runoff from the Lake Washington and Oddar River watersheds (540 square miles) avail-she for power at the lock site. Drainage, flood protec-tion, and accessfullity to shipping will greatly schanoo and values around the lakes. Lake Union will be-come virtually a great dock in the vary heart of tha

city. The removal of the natural between the two labes and the establishment of a connection with the base of the setablishment of a connection with the control of the con

chamber. The large lock or chamber will be about 800 feet long by 80 feet wide and 26 feet deep and will take any vessel likely to visit Puget Sound for many years to couse 'the little lock will be 180 feet long by 30 feet wide and 16 feet deep and will be used by small craft of all descriptions, the number of which is very large and rapidly increasing. Probably 90 per

ent of transfers of vessels will 'se through this los The entire structure will rest on an excellent for dation of very hard, tenacious hits clay of great depth It will be built of reinforced concrete and steel and It will be built of reinforced concrete and steel and will embody the best features of modern lock con-struction. The controlling works at the fock will con-trolling the controlling works at the fock will con-trolling the controlling works at the fock will con-trolling the controlling works at the con-formed by the lake gives complete control of the rea-of and distributes the flow quite overly throughout the year. The revenue from this power will resture about it per cent on the cost of the plant and will about 14 per cent on the cost of the plant and will pearly pay for the future operation and maintenance of the canal The problem of maintenance will be greatly simplified by the entire absence of sediment in the water and consequently of deposits in the canal greatly simplified by the entire absence of sedimen in the waler and consequently of deposits in the cana and the necessity for dredging The physical problems involved in the building of the canal are of the sim plast chara

is canal has been the droam of Seattle e it began its existence, but the rapid growth of the city and the great variety of interests affected create oppo-aition here and there which has succeeded in delay-



This great sait water lake will form an excellent harbor for laying up saval vessels and will increase harbor frontage of Seattle THE LARR WARRINGTON CANAL

ing the work much longer than should have been the case It is now expected that the project wiplated within the next three or four years ot will be com

The Boy's Endorsement.

The Beyle Kindersmesset,
Standing fifth among book must in demand during
the wesk ending January 18, 1916, as reported by the
Circulation Department of the New York Public Li
braries, is "Tha Scientific American Boy," by A. Russ
all Bond "This addressement from the boys them
solves counts for more than the many favorable raviews that this book has reveited Boys are not infused by the criticisms that appear in magazines,
that they frequently call for a fermionic. The fatter
that they frequently call for a fermionic that they
requestly call for a fermionic that they
throughly appreciate that par
ticular work. "The Scientific American Boy" size. evidence that they thoroughly appreciate that par-ticular work. "The Scientific American Boy" takes up the story of a group of boys wile hull tree hults, log cabina, caves, bridges water wheels, tents, tramp-ing outfits, etc. A sequel to this book has just been published, entitled "The Scientific American Boy at published, entitled "The Scientific American Boy at School," which continues the story and tells how to make a variety of things, including dams, boats, gliding machines, and disk, canoes, and many new devices for outdoor recreation

The Current Supplem

Some Curtis turblue driven units of 14,000 kilo-watts capacity are in course of construction at Scheneckady What 14,000 kilowatts means is shown in the Current Supplement by illustrating the and of condensed water required, coal consumed, etc. The subject of marina propulsion by electric motors is presented. Lucien Fournier describes an automatic The representation of the sease is the sease

Albert Moyer, the well-known anthority on concreta, presents a paper on the possibilities of the uses of mineral oils mixed with concrete. The treatment of disease by injecting into the blood the serum, or watery part, of the blood of an animal that has been tery part, of the blood of an animal that has been made immona to that disease is popularly discussed by Dr Fritz Meyer Dr V Grafa contributes an excel-lent article on the miniature art of Nature and Science Suggestions are made for observing Hailey s comet. Dr H A Gins writes on the optical method of studying immunity to bacterial disease. Many of cur readers have no doubt wondered how an ex-plorer can really prove that he reached the Pole, it years can really prove that he reached the Fole, in view of the recent Coponhagen decision. The method of examining an explorer's notes and ascertaining whether or not he reached the Fole is excellently pre-sented by Professor J Hammon Smith

Correspondence.

WHY BAND SAWS BREAK

To the Editor of the Scientific American Mr II Miner of Lumberton, Miss, has inserted an MY it Miller on Lummerron, Miss, has inserted an article in your valuable paper, the Stavrict America va of November 19th, 1909 concerning the causes of breaking of springs. He also relates the breaking of bandaans, which is a very important point to overcome, as it is a well known fact to all who use bandsaws that a saw after running a few hours becomes longer in the back edge on account of the back pressure from the saw guide which gradually brings that tension more and more toward the teeth or sawing

if any little cracks exist by reason of in If any little crasses exist by reason of improper in-tabling they will certainly increase and the flaw will break. If the manufacturers of bandsaws would study this matter they would soon find out that the fault lies in the carticsa way of making the sleet and pre-

Manufacturers who have won reputations for mak Manufacturers who have won reputations for mass ing bandsaws in smalkr sizes as from % inch to % inch, are looking for too great a profit and forgot to make use of the same skill exerted in making band-

Hy an average approximate estimate a % juch band-saw will not run long enough to wear for nuc-haif dozen filings before it is broken in so many places dozeu filings before it is brokeu in so many pullibat it is impossible to make any more use of it.

H JOHANARN

A CURIOUS PHENOMERON. To the Editor of the Scientific American
While driving along the share of Canandsigua Lake, in the State of New York, on Tuesday, January 4th, I observed a curlous natural phenomenou

The temperature of the air was six degrees above sero, a light northwest wind blowing and the bright sun of the afternoon occasionally obscured by the pres of large and low hanglog cumul us clouds.

The surface of the lake was covered by vacor caused by the difference in temperature between the cold air and the comparatively warm water. This vapor visit and the comparatively warm water. This vapor visi-hie in the form of a slowly rising, dense, white mist gathered in spots in masses rising higher than the surrounding mist. As these masses of vapor reached a height of some twenty feet they appeared to take on a rolary motion and formed themselves into columns slowly rising until their apexes met the lowlying clouds, where they spread out in a funnel shape ex ctouns, where they apread out in a tunner snape ex-scily as do water spouts. The columns varied from a foot to possibly ten feet in diameter, some of laem ascending in a straight line and others bent into fan ascending in a straight line and others bent into fan tastic curves by the action of the wind I saw a great number of these mist which during a drive in some two hours, evening a distance of ien miles atong the lake shore, and as they formed and drifted slowly across the water Himminated by the rays of the set ting sun, they were a beautiful and to ino a unique

Can you tell me if similar phenom na are often ob sorved ! TANKS S LAP

Speaking before the Royal Society in Loudon on the subject of magnetic storms Mr E W Maunder super fine-indend of the Solar Department of the Royal Ob-servatory, Greenwith said that magnetic disturbances were in some way connected with the rotation of the sun upon its stm it was clear that, besides sending sun upon its site it was clear that, besides sending us light and heat the sun sent some kind of influence which came only from certain portions of the surface and came along closely restricted line. They close the came of the control that place when a sun spot had got to a definite portion on the sun's dals. If they took it that the influence that came from the sun and struck the earth came from the center of the sun spot, they would be able to calculate how long it had taken place, and, assuming that, they found it would take about to six hours to come from the sun, a distance of \$3,000,-



A GREAT OPEN-AIR TELESCOPE

BY PROF. S. A. MITCHELL COLUMBIA UNIVERSITY



A giant telescope has been rected in Germany hav-ing for its main purpose the making of astronomy popular through exhibitions to the public of the heav inly hodies. The United States has repeatedly followed Germany in her advances along scientific times and here would be a splendld opportunity to emulate for by the erection of a great public telescope (say) to New York clay

A contrast of this new German telescope at Trep-tow (near Reclin) with the highest development of American manufacture proves of the greatest interest in the Yerkes telescope (see Beievithi American De cember 25th 1908) we have a great instrument given cember 2ddi 1998) we have a great instrument given over in taxi rewarth, handled by a corps of exper-astronomers leaders in their special lines of work Prof E Barnard is there with his keen eye for the necessarement of the positions of council, star clusters, etc., for the depicting of slight planetary details, or cit, for the depicting of slight planetary details, or with the help of the photographic plate for the por-trayal of Mars on a large scale. The greatest living authority on double stars i rof S W Duraham spends two nights such week with the great 40 lach refractor The director, throf E B Frost, takes care of the spec-trescope side of astronomy by photographing the spec-tra of stars for the determining of their motions in the line of sight and by day time the felescope is made use of to learn of interesting pho-

use or to tears or interesting pro-mom na about the sun. This great telescope is a model of engineering perfection with its great tube and massive parts rising floor and ro-tailing dome it is mounted in what is known as the equatorial

But how different is the Treatow telescope. Erected with other pur-poses in view, it is not increasary to have expert scientists to keep the telescope curployed almost every hour during the day and night constructed under a different plan it is unnecessary to have a great elevating floor toside of a huge ro-tating dome, for in fact the dome tating items, fir in fact its dome is done away with and the tele scope is used to the open air. This then brings something radically new in the old setting of an ordinary, something unitrily different in the construction of a great tele strunced bus owny points in its favor that make it a most interest

The director of the Trentow Obry, fir F 8 Archenhold, by

his radical ideas came into opposition with the Ger man scientists who ridicated the idea of placing in the open air with no protection from the wind a great the 683/10 feel in length seven feet longer than the Yorkes telescope (62 feet) But undausted, Dr. Arch enhold persevered and finally succeeded in tollecting sufficient that for the crection of the ingress tele-acope in the world. And this, too in actentific Ger

many:
The front page illustration shows the Troptow telescope. The old equatorial form of monotting was described by the first partial from, for this requires that the eye-ond of the telescope be raised through a vertical distance approximately half the tength of the telescope tube in viceling, a sign overlead and one near the horizon.

This recognition is not provided and one near the horizon. victing a star overlived and one near the horizon This measurated a very expensive observing floor run by electric motors (Schwitze Amarican, December 25th, 1908). By sufficient the telescope tube in a great fork and employing suitable counterpolace. Dr Arch enhold was able to have the exceptere over the center. of motion and run the telescope tube upward into referring to the illustration. This climinated the rising floor and saved many thousands of dollars. The low forked mounting with its heavy movable parts plered on a solid concrete foundation insured a stable lostrument and as the whole construction had no

preat height it became possible to house the telescope by turning the long telescope tabe into a horizontal position and pulling over it a cheap portable house position and pulling over it a cheap portable house in Juning the tescope in the open air it became possi-ble to entirely eliminate the great dome, and thereby save again more thousands of dollars. The result of those plans were that Dr Archeabold was able to built the completed instruments for the modest sum of 802,500 Off this seam \$11,500 was apart for the time, which was made of the colebrated Jensa giass ground by the old-scatchibled from of ticninks, in all the seam of the s

care reasonal departure from old-established forms is climinating the dome has many points in its favor bedges the mere saving of money, and siso many drawback As is wall known to astronomors, the temperature of the night air is continually failing (especially in the early part of the night), and it is impossible to have the air in the interior of the dome at the same lemperature as the outside air. This causes the heated air to pour out through the sit of the dome, and also produces currents of air in the interior of the telescope tube itself. All of this makes "bad seeing," and a distortion of the telescope image. distortion of the telescopic image-

ry to drive the telescope to make it move it is necessary to drive the telescope to make it more from east to west, otherwise overly to the earth's rotation the object would quickly more from the field of the telescope in the Trepton telescope both observer and instrument must be moved, and the datalis of how this is done by a ¼ horse-power motor regulated by clockwork can be seen in the smaller illustration.

The Cost of Our Havy.

IT COSTS A GOOD DEAL OF MOREY TO BUR A NAVY The actual expense of running the navy of the United States for the past fiscal year amounted to \$48,790,000 in this sum is included everything, from the pay of entisted men to the repairs and equippage of vessels.

And the vessels include the tugs and receiving ships sa well as the battleships.

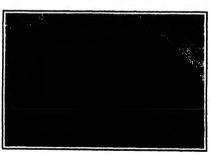
as well as the battleships. The latticeships of the Atlan The battleship "Cannet ticut," flagghlp of the Atlan tic fleet, may be taken as an oxample of the cost of the type in service. The pay of offers and califated men attached to this vessel with the other expenses amounted to more than \$198,000 during the flees! year just passed. The Atlantic fleet in that privide included siztees of mix-tleast war vessels in that privide included siztees of mix-tleast war vessels. vis., six of the "Connecticut" type, five of the "Georgia" class, and the others ranging from 13,000 tons to 11,500 via, sin to the chars vanging from 13,000 tons to a character of the chara

including repairs, is \$677,500 a year The classes below the "Georgia" re The classes below the "Georgia" re-quire expeditures ranging from \$532,000 to \$604,000 White the fig ures will vary for the armo vessels in different years, the cost changes vary little from year to year for the same class \$10.521,000 was the total cost for running the sixteen ships of the Atlantic fleet for the peat year There were twenty three first-class battleships in commission last year, and the total cost of keeping them in service exclusive of repairs, was \$13,035,000, making an average cost for running them \$592,084 On all these ships the repairs amounted to only \$100,-

It might seem atrange, but it is a fact nevertheless, that it costs more to maintaic a cruiser than it

a fact seventheless, that it costs more to maintain a cruiser than it does a battleship Three were ten it does a battleship Three were ten it and the seventh of the sevent





View taken under the mounting, abowing the electric motors for driving the telescope. A GREAT OPEN-AIR TELESCOPE.

Dr Archenhold s pian of doing without a dome elimi-nates most of the effects of air currents, for there is no "dome effect," as astronomers call it, and the air in the telescope tube quickly takes the temperature of that outside Here, then, is a decided advantage of that outside. Here, then, is a decided advantage in the unfortunately the toleccope being in the open air nakes it the sport of overy passing wind, and aven a night wind is agit to set up a vibration in the tole-scope, especially so when the tube is so long as in the Archenhold (descope, which is supported not in the middle, as in the ordinary tolescope, but entirely as it middle, as in the ordinary tolescope, but entirely as it. one and Though the vibrations may be small and imperceptible to the eye, still when the telescope in poleted at a fixed star the immeane magnifying power of the long telescope would make oven the slightest fremore readily visible and would spoil the use of the fremore readily visible and would spoil the use of the instrument for accurate work. It would seem that for the important researches of the exact astronomer the operaint inslessopes would be a failure, but for pub-tic exhibitions only it is another story. The absence of dome and rising show elliminates a great amount of the expense, and the modelet amount of the sopular aubscriptions can be all put into the construction of a telescope thus obtaining a much larger instrument. The telescope is raised and a star located by means In ord of a 61/2-horse-power electric m come pointed correctly at the s

AMERICA'S FIRST AVIATION MEET AT LOS ANGELES

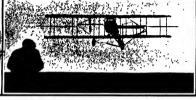
DETAILED ACCOUNT OF THE FLIGHTS MADE BY THE AMERICAN AND FRENCH AVIATORS

The first aviation meeting to be held in this country opened at Los Angeles, Cal, on the 10th instant. Louis Paulhan, the record-breaking French aviator, was present with two Farman biplanes and two Bieriot monoplanes. America was represented by Gienn Curties, C. F. Willard, and C. K. Hamilton, all of whom few Curties biplanes. The field their serveries are as as not present the country in biplanes. The field that serveries are as as no

drome was located a few miles from Les Angeles. It was not as lides likes for flying eines it was not level. One end of the field was at a considerably higher elevation than the other and the machines were, therefore, obliged to fiv quite high in order to pursue a level course. A hexagonal course of 161 miles was used Only a few short flights were made by Meanr words of the contract of the contr

Curtiss and Willard the first day Mesers teachy and Khabenshus, in their dirightile balloons, few 200 feet above the grand stand against a whind of 10 to 12 miles an hour Paulhan made his initial sight of 1% minutes at this time, covering an evil mated distance of 1% miles. In the second flight he rounted aloft on minutes. Bits third flight hated 29 minutes is





The two Farman biplanes flying in front of the grand stand.

The Knabenshue and Boushy dirigibles are even at the right

Chas. F. Willard Sying in the Curtiss biplane of the Aeronautic Society, Mr Willard won the prize for slighting upon a square having 20-foot sides.



Mme, and Mons. Louis Paulian.

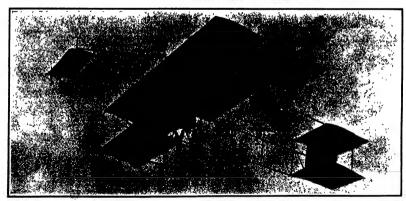
The daring French aviator and his wife held the record for cross-country fixing



The Bieriot menoplane in flight as seen from a baileon.



Three two views of the Bierlot monoplane give a good ties of its equally bird like appairance when viewed from above or below. Pauthan flow this its above without difficulty, but his incorrections and broke both need below.



Observed 4 Universal Paulinas making his record-heroaking high-flight in the Farman hiplane. He reached an official height of 4,165 feet Desirement of Universal Desirement of

sides dashing at the grand stand and just clearing the heads of the speciators, he flew out of sight over the neighboring ranches

On the second day the first flights were made by Paulhan, who look out his new Farman biplane and drove it thrice around the course in a stiff wind, said to be of 18 miles an hour velocity, which was be from the ses. Nort for variety he mounted one of the tiny Bieriot monoplanes, with which Miscarol had been attempting to get off the ground—ite had no difficulty in flying it is the wind that was blowing. Although it bobbed up nid down and was toward about like a small boat on an augry wa Paulhan flew about the field and several times swept past the grand stand, perfor various manuaces and rising to an estimated height of 200 lot | The spectators gave a sigh of relief when he flually landed across the field from the stand | He was seen out age'n with his Farman biplane, in which he quickly disappeared from view far to the north Shortly after he reappeared over the trees of a nearby ranch, and frequently charged at the grand stand, turning aside just in time to cicar the succiaiors or cise to sweep over their heads. This flig 5% initial lasted 21 minutes and 12 seconds This flight of abo It was the fourth flight he had made on the second day of the After ('aulhan's flights, Mr Curtise brough out his Rheises racer, which is fitted with an 8-cylinder unter-cooled motor of 50 horse-power Mr Fanculill climbed on board with Mr Curtiss, and the machine shot lain the air for its speed test with a passenger After describing a wide circle in front of the grand atond Curles flew around the course at a speed fig ured out by ident Paul Beck, of the Army Signal Corps—one of the judges—at over forty miles an hour Paulhan immediately started a flight At the same time Measure Williard and Hamilton started or Curiles followed them a few moments aft

Clifford Harmon as a passenger All four machines were flying at the same time a spectacio well worth seeing Paulhan landed a worth seeing Paulhan landed a few minutes later, took on one of his mechanics as a passenger and twice circled the course as readily as he had done slone

Curiles established a new start ing record and also a record for landing but Willard best Curtiss in the latter respect. Curties start od frum n marked square of square feeet flow miree around like field in something over two min uses and landed exactly on fire aquare from which he started He broke his own record for starting by selling of the ground in 62/5 by galling off the ground in 6.275 seconds after a run of but 98 feet Paulhan required 12½ seconds time and a run of over 100 feet The great event of the third day

was Paulhan's successful attempt at breaking the world's record for altitude. The existing record had

een made only six days before by ifubert Latham at Mourmelon, France, with his Antoinette monopiane, and was 3,444 fee! Paulhan started in front of the grand signd, and heading north, he went steadily upward in circles until he was nearly a mile high So high did he fly that to the even of the outcokers the machine appeared the merest speck in the sky After ascending some 46 minutes, he pointed his bi piane once more toward the carth, and came down at a much greater angle and in about one-sixth the time (7½ minutes) The registering baromejer on his ma chinn registered 1535 meters or just over 5,000 feet, so that Psuihan had apparently beaten Latham's re ord hy some 1 500 feet I is was given a great ovation upon landing The total length of the flight was 53 minutes 46 1/5 seconds Paulhan a height, as meas-ured from the ground, was officially determined at

The fourth day Paulhan gave a good demonstration The routh day Paulan gave a good communication of the weight-carrying ability of his new Farman machine which is much smaller and weight 226 pounds less than the regular Farman hiplanes, by taking up less than the regular Farman hiplanes, by taking up his two assistants Maisson and Miscarol, and circling several times around the course with them. Curtiss circled the course ten times in 24 minutes 54 2/5 sec-ands. Paulhan tried to beat this time and failed by five seconds only Previously, he made three laps in S 16 1/5 carrying his wife as a passenger After cir-5 18 1/6 carrying his wife as a passenger After circling the field ho slighted readily in the marked-off square from which he started In another flight of minuted duration he carried fiver Ferris as a passenger. He again rewords to his sensational methods, fifting low over the grand stand, making sharp turns, etc. Hamilton, Paulina, Curries and Wilserd qualities of the control of the contro made a flight with his vertical rudder locked, in order to show that this rudder does not have to be used in connection with the balancing planes, as is done by

the Wright brothers when they warp the planes of their machine to correct its transverse equilibrium.

This combined operation of the equilibrium-maintain. ing device with the vertical radder is one of the arest claims in the Wright patent. Where plane strongest olaims in the Wright patent. Where plane warping is supployed, it is necessary, in order to prevent the slewing around of the machine, when the plane is warped to a greater angle. With balancing planes like those used by Curties, the resistance inplanes like those used by Curtis, the resistance in-serted at one and of the machine is as great as as it, to other, the consequence bolog that the varietal rudder does not necessarily have to be used. This slight with the rudder fustemed demonstrated very well the differ-ence between the two systems. Mr Williard again few once around the course and landed in a measured square, thereby winning a price of 1500 Paulbau was ented with a \$500 allver cup by onthusiastic citi zens of San Diego Tho next day he made a cross country flight of some 16 miles to San Pedro and back circling above the revenue cutters in the harbor and being greeted with theors by the inhabits has also made & circuits of the course with his assist han aiso made 6 ctruits of the course with his assis-tant in 18% minutes, and afterward few twice around it alone in the Bisriot monoplane. His fastest lap in the latter mas hills was done in 2.4%, which equals a speed of 3414 miles an hoar: Ourtiss made the feat cell lap of the course in 2.12—a reped of 4345 miles per hoar: Sinbequent to a race with Beachy, Kasban-shous made a lap in his dirights in 5-10376—rate of shue made a lap in his dirighibe in 5-10.2/5—a rate of 184 miles per hour Hamilton tried for the slow lap prize and succeeded in making one circuit of the course in 3 36.2/5—a speed of 20.78 miles an hour. The time uf Willard's slowest lap was 2 11.1/5 Hamilton made 12 minute flight for altitude, reaching a height of

a 12 minute age --53014 feet.
But very little flying was done on the eixth day of
the meeting, owing to wind and rain. The field was
wet and muddy, but notwithstanding this, all the ayi-



Prof. J. S. Zerbe's muitiplane. This machine is of the following plane type.

A HOVEL AMERICAN ARROPLANE AT THE LOS ANGELES MEET

ators got off the ground without much difficulty and neade a few short flights. Paulban attempted to b Curtiss' ten sap record, but he was unsuccessful lard and Hamilton also made an attempt at this record, the latter covering the 161 miles in 30 34 3/5 or at an average speed of 317 miles an hour Mis-carol, Paulhan's assistant, made a brief exhibition flight with a Bleviot monoplane. In landing, the maflight with a Bieriot monopiane In landing, the ma-cine tipped to one side, causing the wing to strike the ground and break off. The accident was biamed upon the aubstitution for wing warping of the movable ends of the tail, which normally mova together and act as the Borksontal rudder By moving these en act as the normontal rudder by moving these ord of the tail in opposite directions, the transvarse equi-librium can be maintained fairly well under ordinary conditions, atthough this method is not so positive as that of warping the wings themselves. Sunday January 18th, but few flights were made, as the vessiber still remained inclement. The following

day, however, Paulhan attempted to break Farman's record of 4 hours and 17 misutes. After remaining aloft 1 hour, 58 minutes, 27 2/5 seconds, durin time he covered 75 6 miles. Paulhan was oblige ed to de time he covered 76 miles, Paulhan was obliged to the served on account of a leak in the gasoline tank. He therefore did not come within 3% hours of equaling Furnant's record Hamilton also Sew during some of the time that Paulhan was making his codorance flight. He kept at a lower levels and made it circuits of the course, but was obliged to stop on account of motor trouble. Curries lowered this time for the laps minutes, 45 2/6 seconds (40.71 mile His fastest iap was three seconds slower than his best rits latest lay was three seconds slower than his bett. Bankn overed ten hap in his 5 1/6. Beachy made one lay in his dirigible in 4:57 4/5. Beachy made one lay in his dirigible in 4:57 4/5 to 1/14 duties on hour? This was the featest hay second by any dirigible during the meet. "The Gill-Deach biplane, which is very monh illne the Cortina, and which was constructed by two gentlemen from Ballisnoys, life, made everal intempts to got off the ground, but was only successful in sunfate; a five short impus. We Citized Harmon made a short digits alone in his new Curtius mealine. Translay, January 18th, is hoteverthy for the long cross-country flight of Monz. Fuchkan, who flew to "Rocky" Ballwish ranch and hock, a distance of short

cross-country flight of Mona. Faulhan, who flew to Tacky "Baldwis" ranch and back, a distance of shoot 47% miles, in 1 hour, 2 minutes, 48 4/8 seconds. In the course of this light he rose to a height of 1,10 feet, according to the registering barometer carried in the highest height of the time he was at a height of background the second of the time he was at a height of heavy, which was made in about 28 minutes, Faulhan and to fight hagainst a rather strong westerly wind, and yet he is said to have required only about three minutes more returning than he consumed in fights to the ranch Probably at the elevation at which he was ten work of the said to have required only about three mixtures more returning than he consumed in fights to the ranch Probably at the elevation at which he was traveling he did not secondare as strong a wind as was blowing near the earth.

January 11th was given up to the making of a munched of the secondary of the secondary and the secondary and

turned safely arter 13% minutes, naving covered over 30 miles across country without difficulty. This flight was twice as long as that made by Orrille Wright at Fort Meyer last summer in the speed test for the gov-ernment. It is the longest eross-country flight ever made with a passenger, although it was not by any means as hazardous as the one made by Mr Wright.
Other flights were made with Mrs. C. F. Rishon Lieut. Paul Beck, W R. Hearst, and a reporter for a New

R. Hearst, and a reporter for a New .

York newspaper For the second time Lieut Beck tried dropping dummy bombs upon a measured square on the ground While he did not succeed in hitting the mark, he came very close to it, and showed the possibility of dynamiting a warship or a town in this way Paulhan's last flight was way Paulhan's last night was senger It was a cross-country flight of 8 to 10 miles lasting about 20 minutes. Hamilton made three attempts at high flying, rising to heights of 455, 300, and 700 feet, respectively The Gill Dosch biplane was finally made to fly and yanio was maily made to fly and was driven once around the field by Hillary Beachy In descending, however, it was badly damaged Cnrtiss made two laps, but was unsoful in breaking his speed

The last day of the meet, January 20th, Curtims made the longest flight he has ever accomplished

Starting at \$'25 P M, Paulhan had made but two or three laps, when Curtiss went slott about half a lap behind him Mounted on his Rheims racer, Curtiss steadily gained upon Panihau, and after making three laps passed him in front of the grand stand, his small hiplane flying directly above the larger French ma-chine. This was the first real race the spectators had values. This was the arrived rick in a spectators and witnessed, and Curtiss received great appliance. He continued to fly around the course until he had cov-ored 30 laps (483 miles), his time being 16 35 Panihan made 35 circuits of the course (6425 miles) in 13434 The average apoeds of Curtiss and Paul-han were respectively 378 and 2577 miles an hour has were respectively 178 and 2877 miles an hour thanflion made a slight to Messes, about 7 miles from the aviation field. He rose to a height of several houseful field and disappeared from view upon the horizon. Upon his return the crankshatz of his motor broke when he was nexty back, and he proceeded in gilding down to the field and nighting without make the contract of the motor of the hist day was a parend showing the contract of the cont

The Boston Astronauto theory.

The first Astronauto Show to be held in Assertion to be recommended to the second of the second o

Scientific American

Department:

TOOL FOR GUTTING STAY BOLTS

Stay bolts in locomtive boilers usually break near the inner side of the cutside boiler sheet. When the broken bott is in position behind the frame of the ico-motive it is necessary to drill the bott on the firebox and drop it out of the way, after which a hole is bored



TOOL FOR GUTTING STAY BOLTS

through the giub in the outside sheet and the part of the bolt remaining is cut out with a round nose chisel.

This is difficult to do, and it sometimes happens that This is difficult to do, and it sometimes happens that the shoot is grooved in the operation, and trouble is caused thereby With a view to overcoming this diffi-culty the tool limstrated in the accompanying engra-ing has been invanted. It consists of a cutting mem ber arranged to movo in a sheath which can be ditted into the hole drilled in the bott and serve as a guide into the hole drilled in the boit and serve as a guide for the cutter which is then operated to cut out the boil. The body of the tool, which is of heanousi form, is indicated at A. Projecting from the body A is a blade B formed with a bead C at its tower edge The sheath above referred to it is indicated at D and is formed with a central bore to fit the bead C and as to its receive the fist portion of the blade as in all cated in Fig. 2. The sheath D is reduced at B to Grom a centering guide. The bott to be removed in form a centering guine. The solt to be removed in first drilled out, as indicated in Figs 3 and 4, to the diameter of the part H of the sheath. The portion H is then fitted into the bore, after which the cutting tool is operated to drive the end P of the blade into tooi is operated to drive the end F of the hlade into the bolt and cut it out as indicated in Fig 1 Aftor the bolt has been cut at three or four points it may easily be knocked out. Mr William Smith of Peab-tigo, Wis, has secured a patent on this new cutting

TILISING ORFILIFORAL FORCE FRACTICALLY, Dr Abbert C. Alberton, has endewnored to turn to precibel use the enormous centrifugal force generated by a rotating body file invention is at present embodied in an actually constructed and operative air compensor, with what success we leave our readers to judge from the accompanying illustration and the fol-lowing brief description

lowing brief description. In each of two parallel guide frames a block is sconnected with the platen rods of a duptex compressor. Through the blocks an axie runs to the end of which is attached a valid-tearring arm. When the arms are thrown foreiby to one side or the other, each block moves beak and forth, beause the centrifugal force produced at the weighted end of the arms is endeavoring to corry the weight off at a tangent to the circle from



an ellipsetdal curve due to the shifting of the block.

The two guide frames, as has been stated, are placed
parallel to each other, each having a block, arm,
weight, etc. The blocks are beld in opposite positions
so that the arms will balance each other and so that
the two hlocks will always reciprocate in opposite
two thocks will always reciprocate in opposite

directions. The means employed to hold the contribugal arms in position, and yet allow them to follow their respective "polisis" consists of a shart between the guide frames with two crank arms, each of which has a relative to the contribution of the contribution of the contribution of the contribution arms are turned by the plans which protected the contribution arms are turned by the plans which protected the contribution arms are turned by the plans which prothe contribugal arms are turned by the plus which profit in the arm-dots. The greater the speed of the rank, the greater the power of the centrihugal arms Because there is no connection between the centrihugal arms and the cranks, the reciprocating action of the blocks is caused untirely by restrifugal force II is a curious though easily comprehensible farther than a curious though easily comprehensible farther than amount of centrifugal force developed was no great

in the machine illustrated that it was necessary to cut away part of the material of each arm and to reduce the weight so that the pistons would not ham-mer against the cylinder heads.

BRACE FOR BRICK KILFS.

During the process of baking bricks the kins expand and contract, and if the sides are not braced after they have contracted they are apt to topple over if the kiln should expand again. Hitherto it has been the custom to brace the sides of a kiln with tim bers and wedges which work involves considerable



BRACE FOR BRICK KILWS.

danger to the workmen while adjusting the wodges ove this danger an inventor has recent In order to remove this danger an invastor has recent by devised the bree illustrated in the accompanying engraving. It comists of a bar A formed with each stang its upper edge. One and of the bar is provided with a pair of stride safquest to capage a curved siot P and the provided of the provided of

gaged by a pawi & which is ful crumed in a member F that is supported on a timber disposed along the side of the kiin. The atong the side of the Rini The member F is hald in place by tooth G, which dig into the wood The pawl E is provided with a thumb piece B by which it may be lifted ont of engagement with the ratchet teeth in the bar in using brace the workman thrusts the supporting member C against the member F in position on the tim-ber Then pressing against the kiin with his foot he takes up the black between the two members O and F by engagement of the

the bar 4 Mr Anatole Perusse (care of J McLess 345 East Strand, Rondout, N Y) has just received patent on this improved brace for brick kilns.

BUTCHERP SCALE PAN.

It is customary for hatchers to weigh meat in large scale pans that are usually provided with a rigid ball which is also of large dimen sions, and the fact that the ball is rigidly attached to the pan makes it inconventball is rigidly attached to the pan makes it inconvenient to stow away the pan when it is not in use. The accompanying engraving illustrates an improved form of the child is so mounted that it may be folded down against the pan when it is

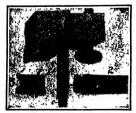


BUTCHERS SCALE PAR WITH FOLDING BALL

not in use, but whenever desired may be locked rigidly in an upright position The ball is not directly con nected with the pan, but to a pair of rails which serve to distribute the strain in our illustration we have icitered the pan proper A. Riveted to the pan at the bottom are a pair of diametrically disposed straps B which cross each other at right angles and are bent up at the ends against the sides of the pan. The two rails C which are curved to conform approximately to the shape of the pan are secured to the ends of the Hinged to these rails is the bail B which is bars B provided with the nausi hook for attaching it to the scales One of the rails U is formed with an outwardly scales One of the Tails of a former with a no unward and projecting fining E. In which is a square aperture adapted to receive a finger F that is free to slide on the ball D. When the finger F is fitted into this aperture the ball is held rigidly in upright position. On Illing up the finger F the ball is reveated and may be folded to the position indicated by dotted lines in the ongraving Mr Jacob Feldman of 70 Cariton Avenue Brooklyn, V Y, has recently secured a patent on this improved scale pan

DOOR SECURER

A very convenient device for securely locking doors has recently been invented which should be of par-ikular value to traveling men who often find it necessary to occupy a bedroom not fitted with an ef lock The locking device may readily be applied to any door without marring it in the least. As shown in our illustration, it consists of two plates. larger pists A is provided with teeth which placed against the lamb of the door and when the door placed against the jamb of the door and when the door is closed on the plate it forces these teeth into tho wood The opposite end of the plate A is turned back upon itself to form a hearing C the purpose of which will presently be explained A square opening D is cut through the body of the plate A and adjacent to this opening a can or eccentrically mounted disk E is provided The second plate, as shown in Fig 3, is formed with bearings F adapted to fit st opposite sides of the bearing t and recrive a screw that passess through the hearings of both plates, being threaded into one of the bearings F. The smaller plate is also provided with a lug G which projects through the open



SIMPLE DEVICE FOR SECURISE DOORS.



ing D in the plate A. The lug G is recessed to receive the cam B, and the latter is turned to press the step Hagainst the door and thus lock it shut. In order to allow for the movement of the smaller plate as the cam N is turned the bearing U of the larger plate is converted as shown in the drawing. The inventor of clongated as shown in the drawing. The inventor of this door securer is Mr Charles W Lent of Tingley,

AW OIL CAM

The oil can illustrated in the accompanying ongrav ing belongs to the class embodying a flexible bottom which is operable to cause a flow of oil

The Construction hat shown, however, is arranged to provide a
considerably greater flow of oil than is obtainable in
case of the conventional construction. This result is
sweared by providing three disphragms in the can, one
of which serves as the bottom of the can, while the other two are connected at the center by a nipple In other two are connected at the center by a nipple. In this manner an oil chamber separate from the main portion of the can is formed in the accompanying cograting the can is shown at A with the usual nosalo. It threaded into the upper and. Fitted into the lower end of the can is a retaining ring C which has extend-ing flauges at the upper and lower ends and is also ing fianges at the upper and lower cade and is also but outwardly at the lower and io fit against a shoulder formed in the can body. The dished dia piragins D and E bear against the fianges of the retain ing ring. The two dispiragins D and E are connected ing ring The two dispiragms P and E are connected at the center by the nipple G. The dispiragm or bot tom F is soldered fast to the can body. An oil chamber is thus formed between dispiragms F and E. In operation when the bottom of the can is pressed in ward it drives the oil from the oil chamber with greater pressure than would be the case if the entire can body formed a single oil vessel. At the same time



TRIPLE-ROTTOMED OIL CAN.

the other two disphragms yield as well, thus effecting a large discharge of oil Mr Frederick G Svetilk of Cadott, Wis, has recently secured a patent on this improved off can

AUTOMATIC WAGON BRAKE

ATTOMATIO WAGON BRAKE.

Two patents insverecently been issued on the subject of wagon brakes, describing a form of brake for use on carriages and wagons, that will be automatically applied when the horse is checked or presses back against the load when going down hill. The brake may also be applied by hand and can be thrown brake may also be applied by band and can be thrown out of automatic operation whenever it is desired to back the vehicle. In order to take off the strain upon tho mechanism when traveling around curves or over rough roads, a firship connection is made between the tongue and the brake me hands in Fig. 1 the tongue is indicated at A. It is provided with a crowned retire and the strain of the meanted on weetled stock which he was realists. is indicated at A it is provided with a crowned rollor B mounted on a vertical axis which bewars against a crown roller C mounted on a horizontal axis. The roller C is carried between two arms of a hrake reach D which are disposed at each side of the main reach E and are free to slide longitudinally in the hounds. The and are free to stide longitudinally in the hounds. The hrake reach D is connected at the rear oud to a lever F which is connected by chains to the hrake beam G. The latter carries the brake shoes that bear against the rear wheels of the vehicle. The hrake beam is connect hy a spring to a post H carried by the main reach E it will be evident that when the tongue is present backward or when the vehicle rides forward on the tongue the brake reach will throw the lever F back ward, drawing the brake slices into engagement with the rear wheels. A hand lever extends upward from the rear wheels. A hand lever extends upward from the lever F to permit of operating the brakes manu-aily In order to hrow the automatic mechanism out of operation the tongue A is locked to the hounds by means of a simple mechanism. It countiests of a lever I with a downwardly projecting flange adapted to engage a flanged piece J carried by the tongue. The lever I is mounted in brackets secured to the hounds iver I is mounted in brackets secured to the sources and is normally spring-pressed on to f engagement with the piece J A cord running from the lever I to within convenient reach of the driver may be drawn upward to throw the lever I, whereupon a latch K will engage a step piece serving to hold the lever in set position With the crosspiece J set as shown in



AUTOMATIC WASON BRANK

wheels, while if the piece J is set with the flange at the opposite side, as shown in Fig 2, it serves morely to tock the tongue to the hounds in such position that it cannot set the brakes.

It cannot set the oraces.

The second construction returned to is similar to that shown in Fig. 1, and corresponding parts are reterred to by the same, but lower-case, lattors. The longue a is connected to the brake reach d by mosans of a chain b which passes over a pulley? The brake reach d is connected to a lover f which in turn is constant as the connected to a lover f which in turn is conreach a is connected to a tover y which in turn is con-nected by means of chains to the brake beam y. The brake beam is connected by a link to the main reach c, and is held in inoperative position by a spring attached to the brake reach d. The hand lever for operating the brake is shown at h. A locking device similar to that shown in Fig. 3 is indicated in Fig. 4 comprising a lever i mounted on the hounds, a iug j mounted on the tongue and a latch k The inventor of these wagon brakes is Mr Eben G Dolan of Starksboro, Vt.

ODDITIES IN INVESTIGATION

ODDITIES IN INVESTIGATION

FUNCTION

FOR THE CONTROL OF THE SHOOT STREET HE SHOOT STREET HE SHOOT SHOOT STREET HE SHOULD STREET HE SHOUL

shoes to a com-fortable fit. The

stretcher is pro-

tionary base, formed with an arm at its up-

per end, which terminates in a

knob Enlerne



IMPROVED SECR STRETCHER.

is a holierank layer one arm of which is also provided is a believant lever, one arm of with is also provides with a knob, mating that of the Knod arm. By depos-sing the betierant lever, the knobe will be forced agard, stretching the shoe at the points of contact. These knobs are removalles, and are provided at one siste rounded and the other projecting. Each knob aim-has a square ispered opening adapted to fit the arms plud, either with the prefecting portion bearing spaints the shoe, or with the revended portion, as de-sired

ventor has rece ly procured a patfor rocking chairs, without placing the feet on the floor The particular advan tage of this scheme is that a scheme is that a slight movement of the feet will cause the chair to rock. Fulcrumed to the rockers are



fitted with rollers at one end to engage the floor, at the opposite end connected by means of links to a pair of beli-crank levers forming a sort of a treadle. ing this treedle downward, pressure will be brought to bear on the rollers, causing the chair to rock. When desired, the mechanism may be thrown out of operation by folding the treadle up against one of the pieces of the chair

Bectering Oriental Bugs,
Of the hundreds of thousands of deliars worth of
Oriental rugs brought into the United Bittes annually,
many of them are what is known to the profession
as "washed rugs." This means that brightly colored
Oriental rugs are sometimes washed with a colution
of chorids of line, a treatment which partly bisches
the colors and imparts a coft appearance to the rug.
Tan chemical rustment is a process of washing which
produces the effect of age and a pscullar sheen to the
proof of superfor quality. The fact is, however, that
the process of washing invariably weakens and in
ones instances destroys the materials of the rug. The some instances destroys the materials of the rug some instances destroys the materials of the rug. The progressive effect of the chemical treatment of the rug is this. The chlorins gas contained in the ebberdie of lines attracts oxygen and moisture from the air, by which muristic acid is formed. This cast away the vitials of the fabric. Sconer or later the wool and cotton in the rug become brittle, and thus weakes the warp and destroints the wool. When this deterithe warp and deteriorate the wool. When this deteri-oration is complete, the pile of the rug may be swept away by the ordinary process of sweeping, and the warp, which is the foundation of the rug, becomes so weak that holes appear here and there, and soon the rug is worthless.
it not seldom happens that a Persian rug is too

glaring in some hright hue, perhaps red, and is not salahic. An unscrupulons dealer will subject the rug to the series of washings in chamically prepared water to the series of weakings in commically prepared water in this way he turns ont a rug possessing a soft an itique sheen that is truly captivating, and finds a ready purchaser for the doctored floor covering

A New Comet Biscovered in South Africa.

A new temet Discovered in South Africa.

A new comet visible to the naked eye was discovered
at Johannesburg on January 16th by Innes, in right
ascension 19 hours, 60 minutes, 28 seconds and declins

tion minus 23 degrees, 59 minutes 24 seconds.

At the time of its discovery the comet had an hourly motion in right ascension of plus 41 seconds of time and declination of pins 6 minutes 4 seconds of arc
The comet discovered is hrighter than Venus. At

Lick Observatory it was easily seen with tha naked ope at noon about four degrees east of the sun and one-half degree north of it, moving northeast For a few nights the comet was a brilliant object in

he clear sonthwestern sky just after sunset. Readers of the Scientific American will hardly con Reacers or the Scievific America with hardly con-tines. his commt with Haliny's, which has been the ob-ject of constant study since September 11th, when it was sighted. The South African body is one of the two or three comets which are usually discovered every year

Dr Joseph K. Pogus who is in charge of the Divi sion of Minoralogy in the U S. National Museum, has recently described in the Smithsonian Museum.eous Collections a remarkable spectmen of pyrite studded Ollections remarkable specimen of pyrite studed values of the constraint of the cons unusual occurrence of these minerals in crystallo-graphic inxtaposition is described by Dr Pogue as folgraphic jurtaposition is described by Dr. Pogus as follow: "The pyrite, when the present size was nearly attained, sustained a deposition of grynalized gold upon its surface followed by the precipitation of a small amount of chalcopyrite which, in turn, was succeeded by the formation of the galean. A further slight accretion of pyrite completed the development of the specimes.

Failure of a for-wheel, says Pewer and the Ragineer, unusually begins by the starting of a minute eract on the under surface of the rim at the peint of greatest streas, vin, near the ends of the arms adjacent to the rim joint. The create gradually deepen uptil failures occurs, with all its disastrons onesprenouse. These minute creates are visible to an experienced cap, and careful inspectics will add graduality by the prevention of ty-wheel conjustions.

RECEPTLY PATRICTED INVESTIGATE.

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of Interest to Farmers.

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SCHETCATOR FOR CABLES. - W P.

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Pertaining to Yohlelen, VEHICLE BRAKE.—F A RIGHTAMN, Now-ark, Ohlo The aim in this case is to pro-vide a brake for use in connection with motor rehieve and the life, by means of which the vehicle can be brought to a sudden atop with out arresting the relation of the driving whose, so that libe strain upon the motor, incident to the added application of the ordi-nary brakes is obviated.

nary brakes is obviated.

RINNING-GLAR FOR WAGONS.—W J

Orz. Merlin, Ore. In the present patent the
purpose of the invention is to provide north
details of construction for a freight hauling
wagen, which are light strong and damble,
enable a quick torning movement, largely prevant dostructive were, and that may be prodoced at a moderate cost

dored at a moderate cost MISTON - O KRALER, New York N Y The object here is to provide a motor or explosion regime of the two-cycle type arranged to util but the mostlve agent to the fullest advantage by giving continuous impulses in proper rota tion to a plansility of pistons connected with the mean safet to issure a steedy and uniform rounting of the engine and hence permit the uses of the motor on autosobies and the

ANTIBKID ATTACHMENT FOR VEHICLE-WHEREA.—T T CHALGER, New York, N T The inventor's object is, to provide a device, several of which are adapted to be altached at intervals to a wheel of an antonobile or he lits, to protect the tire and at the name time prevent the wheel from addiding

time prevent the wheel from additing
VISITICAL-PRINCE OR BUNNING-GRAR—
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operation

LIADINIA MACHIVIA. 41 Kanas Heorge,
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loading manure into a wagen An object of
the invention is to provide a device capable
of lifting large loads and of depositing them
in a weiting rebice without the use of engine
or other power generators, the action of the
machine deposing entirely upon the power
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CARRIAGN-LAMP BOX.—R. R. Crizz, Demorrary, Other. The object of the invention is to provide a loss or case, to be exerued toneseth the bottom of a buggy, to cavry an ordinary stable instem on that the instrem may act as a carriage hamp while driving, and so a lan term when out of the buggy or carriage and is serve also us a baster for the buggy or carriage.

DESIGN FOR A FARMIC FOR WINDOW RYADIOS OR SIMILAR ARTICLES — A Record, No Took Godge preBouck, No Took, N T The Godge prefor the state of the st

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DBSIGN POR PARRIC — D. VALENTER.

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sheet.
Pall hints to correspondents were printed at the head
of this column in the issue of Harch 18th or will be
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Atlantic type and the six-coupled type which succeeded it in fast passenger serv-ice Commencing at the tender, which is

los Commencing at the tender, when the this carried on two six wheel trucks, a novsity in tender construction. The tank capacity is 4,000 gaillons of oil and 12,000. gallons of water The belier, 6 feet in diameter has 202 square feet of heating surface in the fire box, 3,275 square feet in the fire tubes, and 1,279 square feet in in the fire tubes, and 1,279 square feet in the feed water heater tubes, making a total of 4,756 square feet. In the super-heating and re-heating section there are

1,i2i square feet of tube surface
The firebox is built up of steel plates,
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The boiler with its superheater and

The boller with its superneaver and food water heater extension is connected rigidly to the frame in which are car ried the pair of trailing whools, the six coupled drivers, and the high pressure cylinders. The low pressure cylinders, the forward truck and the four coupled drivers are carried in a separate frame and the weight of the forward portion of the boiler, feed water heater, etc is iscried upon this forward truk by means of two sliding bearings which allow the frame to move laterally under neath the belier, as the locomotive enters upon a curve. This necessitates employ ing a flexible steam pipe for conveying the steam from the re-heater to the low pressure cylinders and the necessary flexibility is seconed by using both site and ball-and-socket joints in the steam pipe Piston valves are used with both and ball-and-socket joints in the season pipe Piston valves are used with both high and low-pressure cylinders, and the valve motions are of the Waischart type There are two high pressure cylin dors 24 inch diameter by 28 inch stroke, and two low pressure cylinders 38 inch iameter by 28-inch stroke. The driving beels are all 73-inch diameter

The general construction of the freight locomolive is similar to the passenger locomotive, but the dimensions, weights and power are, of course, much greater The bolier is 7 feet in diameter, works The boller is 7 feet in diameter, works under a pressure of 229 pounds, and has a total heating surface, including the feed water heater, of 6 611 square feet. There are also 1,746 square feet of super heating and re-heating surface. There are two high pressure cylinders, 26 inches in diameter by 24 inch stroke, connected to sight-coupled drivers 63 inches in diam eler, and two low-pressure cylinders 38 ected to eight-coupled 63 inch drivers nected to eight-roupled 63 inth drivers The tender contains 4000 gallons of oil and 12,000 gallons of water. The engine alone woights 231½ tons, and the engine and tender together woigh 350 tons. The fotal pull on the draw bar maximum

ower is 54 tons.
It is no exaggeration to say that these ecomotives mark a new era in American ecomotive practice, for although the Mallet system, super-heating, feed water heating and compounding have been tried out separately on various locom tives, this is the first time that these refinements have been embodied so com pletely on a single type

NOW AN AMATEUR CAN PIND MALLEY'S

(Continued from page 192)
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(Continued from page 113) lately, it has been growing brighte quite rapidly of late

un to come to must not be too credulous, and think that the first object he sees is a comet. Many times I thought I had found the comet and could see even the iall, but it proved to be merely a siar elongated by the shaking of the telescope

Now the same manner of proceeding msy be applied when the court is rear any other star, Hough it will not soon be so desirably located as on the evening of November 18th After the comet is bright enough so one can see its tall and head, one would not need to go to so great trouble but could systematically search a limited and definite area near it, and in a short time would be able to pick it up. But it is not expected that it will be a very conspicuous object in a small telescope before the close of winter or early spring in the mantime the ambilious amateur astronomer can salisfy his interest by studying it in this man-

try this plan, it may be observed that the evening of February 5th is favorable bee of the comet a proximity to English Piscium Epsilon Piscium is in R. A. 0 hr 58 ndn, and Dec 7 deg 24 min From the unhamuris given for February 5th the fullowing is its location on that evening R A ob to formin, and its Doe; is dog and it min Similarly it will be found close to Delais and 62 Piestum on February 17th, and March 5th it will be just north of 51 Piestum R is neution is much slower during February than for the two preceding months, and so its location ought to be an easy task for the ovenings

ought to be an easy task for the evenings immediately before and after these dates. Where the neighboring star is not as conspicuous, as in the case of Aldebaran one must study the constellation and familiarize himself with the stars in it is often somewhat ledlous, as a few weeks ago, when I tried to locate it among the many small stars in Taurus directly above on It is, however, a helpful study the amaieur

I had a very gralifying and profitable I had a very gralifying and profitable study on the avening of January 14th, as may be usen by the cuts January 14th was the evening of nearest approach to Omitron Pissium, but as this was a cloudy night I decladed to try the follow ing night I had searched but a moment or Iwo when it appeared in view I have seen it two or three times since November 30th, but it has never appeared so dis timely as on this evening It is still fainl, though but a few seconds of are faini, though bul a few accords of are in size, and could be easily passed over if the observer is not careful. It looked more like a small nebula. I could not state definitely but it appeared as though it had a faint nu leus. But the mest of the mening's study was the annistakable motion detected as is clearly shown to the cuts. Stars A and B were about twenty minutes of arc The amount of motion could not be determined accurately with the 45power, and the comet is still too dim to power, and the comet is still too dim to use the higher powers. I have had no further opportunity as yet to pursue this place of the sindy but shall at the earli-cat possible monuoti. It will suggest a problem for other amateurs as much delight in the serviciation of the state of the state in the serviciation of the state of the state of the in the serviciation of the state of t in the scrutinizing of Halley's comet as I have already had

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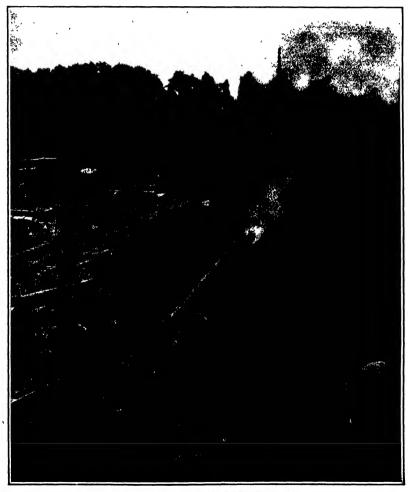




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A POPULAR ILLUSTRATED WEEKLY OF THE WORLD'S PROGRESS

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Discharge et an 8-inch navy rife at indian Head Naval Proving Ground.

WEAT SHOURLESS FOWDER HAS MADE FOREBLE.—I —[See page 121.]

SCIENTIFIC AMERICAN

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ACCOUNTY IN A STATE AND A STATE AND

NEW YORK, SATURDAY, FEDRUARY 51b 1910

The follow is always plast to receive for examination illustrated article on ethicate of timely interest. If the photographs are slowy its article abovt, and the first authority the contributions will receive aparts attention. Acceptant articles will be paid to at tregated aparen rates.

LESSONS OF THE PARIS FLOOD

I is rather surprising that in all the volominous descriptions of the Paris Bood, which have been published in America, there has been given no computes analysis of the meteorological conditions which have turned the usually gentle and treach the later Seles into a rangin forrest, and would unbelievable have in the far famed and beautiful city of Paris. It seems untilizely that any more rainful in the watershed of the Seline could have been sufficient the watershed of the Seline could have been sufficient being the selection of the selection of the Seline Could have been sufficient so that the selection of the

to produce the present enormous flood, and it is prosable that a great part, if not the major part of the flood water, is due to sudden meiting of the snow the term of the flood water, is due to sudden meiting of the snow the term of the flood water, is due to sudden meiting of the snow the snow that the snow

Parthermore the cabled rejorns, referring to earlies streets, hirsting sowers and collegating subways, indicate that another most destructive action of the water must be actively at work. We refer to the subterrancan flow of water under pressure along the face of foundations, subways, severs and other subterrancan massonry work. Where such those contracts are all the state of the same than the subways, severs and other subterrances are the contract of a sever, thore is liable in be a washing away and displacement of the same water of the same water of the same water of the same water of the same of the same water of the same water of the same of the same water of the same of the same water of the same wat

Inquestionably, one result of the flood will be to an indertaking of public works designed to prevent any rejection of the disaster. An obvious plan would be to build a masony resistain wall, or levee, throughout the whole length of the city and for some distance above it, excrpting the work to a height sufficient to prevent any future overflow. So estamates has been been also were arried to an inconvenient height, it would be necessary to increase the cross sectional area of the named either by deciding which is practicable, or low which ming, which because of the great value of the proper by that would have be readened for this

purpose would seem to be out of the question.

There can be little doubt that the overflow at brisk has been greatly increased by the presence of so many nonemer's bridges, each of which embeddiss civil losses, manoring her that greatly reduce the area of the channel, and if the municipal course under the manoring there is unknowned to absence on the course of the channel, and if the municipal course under the manoring the channel.

Scientific American

inicip prevent future overflows the equestion of the obstruction presented by these hridges must surely come up for consideration Judging from the reports it would seem that not only the piers, but the superstructures of the hridges themselves have served to dam the waters and spitt them over the edjoining names.

If the masonity structures were replaced by suspension brifgers or single transate spanning the entire baneal from wall to wall, a great stop would be taken toward the prevention of future floods. But work to Park, the beautiful, aubint to the remeral of so many monuments of the architectural genulus as are fairly by the present succession of picturesque stone arch bridges.

THE NEW YORK DEEP TUNNEL WATER SUPPLY.

UNGED from the standpoint of sound engineering and practical ntility the plan to carry the new five hundred untilion gailon per day Catakill water supply through the length of Manhatan Island in one large deep tuneel, cut through the everalisting rock, is one of the most commendatio projects ever brought before this city, and we feel that a strong to creat the commendation of the control of th

It is unfortunately a fact that is this age of sensationalism there is no more fruitful field for the qualimonage and scarehead writer than that of engineeing vorks of great magnitude, for such works deal with the stupendous forces of Nature, developing to large such as the student of the student of the contraction of the student of the student of the conof technical knowledge and acoud empineering indefound. It is the scalest thing in the world, by a little juggling with figures and a large mis-statement of fact, on write a sensational article (or a series of them for that matter), that will lead the lay public to believe that the project under december is ill conceived and pregnant with hig disaster. For a notable instance of this it is smideral to refer to the agitation against the construction of the Planms Canal on the plans that construction of the Planms Canal on the plans that construction of the Planms Canal on the plans that construction of the plans of the construction of a hunwater-supply tunnel, from one hundred and fifty to two hundred feet believe the surface of Manhattan, have not committed themselves to the achieve without the not exhaustre examination of the hybrical conditions, and the clearest oridence that in econon, durability and public convenience, the tunnel with he a great inmost exhaustre examination of the hybrical conditions, and the clearest oridence that in econon, durability and public convenience, the tunnel with he agreat inment and public convenience, the tunnel with he agreat the across the results of the convenience of the student water in multitudinous pipes and near the antrace of the ground

The proposed tunnel, which will wary in diameter from 11 to 18; feet, will extend from Hill View Reservoir near Yorkers, below the Bronx, the Harlem Rive and through with the full length of Menhattan island, and thence, below the East River, to a terminating point near the Atlantic Avenue Station of the Long leans (Railroad From this point pipe lines near the startes will extract under the Narrows to Staten lained surface will extend under the Narrows to Staten lained

SUPPRAY WITH ARROWS AND THE ARROWS A

the most valuable advantage of the deep tunes matched in that its force Mantatian, Provider, and States, alis of, the water will be delivered at a greater elevation by about 160 feet than would be possible if the survice pipe lines were used, and water will be aviable without pumping on offsee floors up to a height of 260 feet above tide level. This great difference is explained by the fact that the frictional regarding and the survival and the pipe is largely eliminated by carrying the whole mass of water in one large single conduit. Other advantages are the field pipes, the cost of construction and the annual charges will be about 60 per centiles, that there will be no interference with subways and severe, and no opening up of streets during construction or subsequently for repoirs, that failures by breakage will be impossible; that there will be great volume of water at hand in any locality for the centred of large confingrations, and lastly, that by cross-connection of the tunes with the statistic water-supply system, the latter can be subquarded against any operative of supply or other authous example.

OUR LATEST AND PUPAL RESIDENCEATING RESIDEN

HIRB is a description to the the back of the second of the

services the emilities. The "Description of the conditions of the conditions of the conditions of the condition of the condit

The contract called for the development of \$5,000 maximum horse-power and as poed of \$1 knots. In the trials the engines developed a mean horse-power, not not not runs over the mile, of \$3.675 and a mean speed of \$21.44 knots. The maximum horse-power developed to read single mile was \$3,000, and the maximum speed \$21.98 knots Interest, naturally, centered on a comparison of the performance of the "Delawara" "histon engines with that of the "North Dakota" turbles, and although the turbless drove the ship at higher speed, and with a smaller coal consumption per horse-power, the references the summer of the "Delawara" but the proper, and with a smaller coal consumption per horse-power, the references the significance of the "Delawara" turbless of the "Delawara" turbless

In the 84-boar run at 18 knota the "North Dakoda" marned 290 tone of coal, with a water consumption of 1929 pounds per horse-power per hour, and the "Delian ware" 315 tone with a water consumption of 1628 pounds per horse-power per hour on the 184-boar run at 12 knots its Morth Pathota' burned 105 tons with a water (North Pathota' burned 105 tons with ware" 111 tons with a water consumed per hour by the turbless of the "North Dakoda" at 12, 19, and 21 knots respectively was 18,000 pounds and 1840,000 pounds Theoremsettive consumption for the "Delaware" for the main pounds. These figures, considered on the score of cisan economy, are greatly in favor of the resiperacting segine, and they indicate that the cretaing segine, and they indicate that the cretaining segine.

the "North Daksta" Why then, it may be asked, is the government committing itself to the steam inribies as the drive, for the treature battleshies? The answer is, first, that the "Dakstais" turbines have been greatly improved on no is later models. The number of expansion stages has been increased, and the steam economy has been increased and the steam continued by the steam of the Curist turbine both in Dagitate stad (formany) until it equals and long maries engine. An even more important consideration is the fact that the steam tirrities, with fewer working parts subject to breakdown, is a far more reliable engine. It can be driven all day long at the highest speed, without incorring any additional results of falliur; whereas when the reciprocating engine is always precent, even in the beat-constructed angines, and throw the whole engine out of commission through the contraction of the steam of the contraction of

The Prench Deputies were presented resulting with specimens of the new atmaintant coinage with which is proposed to replace the bronze coinage with which it is proposed to replace the bronze coins in Primose. The 10 centimes pieces is described as "hostellate lawrence a country-and as trougher settings," and is hald to be even jess attractive in appearance that is, michael to coin, and to be "engly and tumbed?" "The "host" is much the same, but, if correls, rather smaller, and it is expected that both, if then are deputed, will pease

ENGINEERING.

An appertnessed roof has been constructed at Traro, which it is claimed has the advantages of being registent, most and dust proof, noiseless, and requiring as removal of the old aurânce. It consists in sublet, down on the roodway sheets of expanded exinding to those so largely need for the reinforcement of concrete, and large greet it a 3 link depth of concrete, and large greet it a 3 link depth of confidence of the control of the contr

The fast plans of the new Argustine dreadnoughts have now been passed. The shire will be called called a bare one been passed. The shire will be called called a bare one been passed. The shire will be called the passed that the passed that the passed will be 22 knots. There yield, it is said, be two funneds and two skatelon musts of the new American type. The whole of the twelve gauss will be ace on either broadside. The contract for these ships has been swarded to the Twen River Works, and in view of the fact that there was been buildened to the world, the securing of this contract is a high tribute to American Highlighting.

a high tribute to American shipbuilding American Company has been organized to build a line from Testutian, State of Pusha, through the Sistae of Venezura, to the port of Nanita, asynchemical transport of Sistae of Venezura, to the port of Nanita, asynchemical transport of Sistae of Venezura, the Mexican Lierald. The \$2,000,000 gold capital has all been subscribed, and Singineer Leopoldo Villarest, a momber of the board of directors, says that the line will develop a region rich in fruit, supar, roffeel, etc., and that the freight on the irmon trade since will pay the expenses of the road A branch line will also be operated between Papanita and Misantia.

According to the United Service Gasatte, the first attribut for the Brittish nary, which is now being built by Vickers, Sons & Maxim, will be the largest result of the kind in actitations (I will be over 600 foreign been beingth and driven by two motors of 200 horse-power, which will be capable of driving the vessel at 6 miles an hour in still air The nominal litting prover will be 35 tons, although its unual tools, articular provers of the strength of the s

songhost for navas puriposes. These are over 400 miles of valiway now in operation in functomals and various extensions are in preper. One of these contemplates the building of a line from zecapa on the Northern Railread, about 100 to the contemplate of the contemplates of the contemplate of the contemplates of the contemplates of the navigation of selvandor, where it will connect with the Hritish railway already built, and thereby with the alguidat of Selvandor. Murch the coffee now grown in that republic will thus find an outlet to the Atlantic of which it has long been in seed, and it is highly probable that the built of the import Irade to Salvador will also be conducted along this roote

In his first annual report, Secretary of the Nary Meyer anded for only two heithelbts and one restable ship. These battleabins be recommende about the formal relationship of the second of eight veneric of that type A report ablp is extensive desirable, in order that the first may be made more solf-austaining. Mr Meyer favors the building of practicality all the new veneric under contract the private shipbuilding concerns, not only because these industries should be fostered, but also because the construction is more economical when done by private concerns than at the government many yards.

There is a bill before Congress providing for a band hause of \$10,000,000 for entrying on the work which is now under construction and contemplated by the builted State Reclamation Service A complete description of this noble project for bringing under cultivation arid and semi-arid regions of its West was given in the Middle West Number of the Scravitic Aumenta of December 11th, 1009 It is exposed that by the close of the next year about two million serves will have been reclaimed at a cost of \$70,000,000 will have been recovered and opened for settlement.

We have recovered and copused or sectionest.

We have recovered the report of the Public Service

We have recovered the report of the Public Service

Commission of the Intern. District of the Size of New

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within the city of New York was 56,481 in 1903, while

in 1900 the aumber was reduced to \$2,415. The number of persons itsiled decreased from 444 to \$25, which

is an encouraging decrease. The service product than ever

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ELECTRICITY.

The United Improvement Association of Boston is urging the electrification of Boston railroad terminais. It is considered very probable that the matter will be taken up by the Massachusetts Legislature A rough ceitmate of the cost of obertifying the terminals around railroad at between \$50 000 000 and

Blactob gower is turnished to Mishington, Danmark, from Sweden by means of a suble such runs under the matter season and the season of the season of the power is generated at a 200 foot. But of the Lang River to Sweden and is conducted to the coast by means of calls, where it connects with a submarine called means miles long. The transmission of power by means of a submarine called its outbut number.

A descentration of the use of electricity as an ansenthet was recently made in Hardrock, Considered, and the state of the

From time to time estimates of the power of a light ning discharge are published which would give one the left atta overy discharge represents an enormous current. On this soint frof Eithu Thompson, levier ning at Prinason University on "Amonspheric Eilectisty," recently stated that "we must, however, be causiful one not to exagents either the current or the potential present in a lightning flash. The current in a fineh may at time be only a few amperes or may in a heavier discharge reach perhaps hundreds on a proximately in estream cases some few thousands of amperes. It is doubtful if the potential much accessed and the company of the compan

Fallowing the recent stack on anature wire feet neighbor operation, which has resulted in the presenting of a hill before Congress to limit their activities the nancture are banding themselves together to resist any action which would interfere with their liberties. They claim that any experienced operator can judice of from a docen sets of signals sent at the same time the own which whether to hear as each operator has his own characteristic method of sending a message which own characteristic method of sending a message which crowd. Also that if the preferedensiat serve to go to the expense of installing the necessary apparatus they can cut out all the signals except those they wish to receive. While there are many thousands of amateur stations in this country very few of them are capable of transmitting a message more than a few miles and benneth as amateur traviole in soit to be gaged by the number of amateur stations but only by the number of a mateur stations but only by the number of a mateur stations but only by the number of a mateur stations but only by the number of a mateur stations but only by the number of a mateur stations but only by the number of a mateur stations but only by the number of a mateur stations but only by the number of a mateur stations but only by the number of a mateur stations but only by the number of document of the contraction of the contrac

The new Egner and Ministration mirrorhous transmitter was intelligence, but no various local distances starting from State and various local distances starting from Statesholm. Conventionally long distance for telephones on the continent, or about 1.860 miles for 1.861 miles for 1.862 miles for 1.862

SCIENCE.

During the month of January, 1910, four cometa were at one time in the heavens. The first of these is Hallay a comet, the second Winneckes, rediscovered at the Observatory de is Plata on October 31st by Poro, the third is Danlel's, and the fourth inness.

The Austrian Ministry of Public Works is trying to settle upon a place where redulum may be sold, and the price to be charged. The question cause up when a quantity of ore shipped from Joachimatha was found to contain no less than one gramme of radium. The price of this small quantity has been fixed at 380 crowns (877.11 a milligramme. Those who content paints pure basing radium may have their addresses setpaints pure hasting radium any have their addresses setprise that the properties of the property of the covers information as to quantities and correct prices of radium.

Dr B G Acheson was presented with the Perkin medal at a recent meeting of the Chomists (10th in presenting the medal Prof C F Chandler traved the bistory of the descration and told how it had been conferred upon sit William H Perkin, Dr J B Francis Hurresholt, and Dr Arno Behr Dr Acheson received the properties of the Perkin, Dr J B Francis which will be the properties of the properties of the properties of the William H Perkin, Dr J B Francis which of the properties of the p

The New York Aquartius had a greater number of vations during the year 1706 than ever before, the attendance being 5,803 501 an average of 10,417 a day These figures show that the Aquartium has a greater patronage by the public than all the other measures of the city incideling the Zoolostical Parit combined, and L800 500 more, for the same period than the New York and the contraction of the same period than the New York mance of any theater in the city. These figures are unequard by those of any other museum in the world of which statistics are available.

of which statistics are available. The first spectracopic observations of itsiley's conet, made at Meudon by Desiandres and Bernard, rewal (leady marked discontinities in the spectrum of the rowat. The faint continuous spectrum is crossed by distinctly stronger line: easelally in the ultra-nearly circular nutiens from which stereded two curred rays of feelib criticary, but distinct, and resombling in form the antenne of an insect or the progs of a two-promped foot. The direction of these rays was such that it appeared searrity possible to attribute them soely to the repulsary force of the san. On the following day these appendages were no longer parent to be distinibled. These first observations show that the conset is already sectional consists about that the conset is already sectional consequence and that the light is done party to incondercent gases.

the light is don parify to incandescent game.

An extered, which spears to be a previously unrecorded member of the family, has been discovered by
Bolinot of the Pavic observatory. In examining a pholograph made on October 19th Bolinot observed a faint
linear trave. As the star images on the plate were
perfectly round and sharp, it was evident that the
presion made by a planet in ordor to verify the
observation, another photograph of the same part of
the sky was made on October 24rd. The second part
showed the trave, a little to the southwest of its former
position. It was, therefore, cretainly due to an assimitate
the discovery was immediately reported to the astronous
cal butwast of Kiel, where the satered was provisional
markable discoveries made by the Heary brothers the
scarch for sateroids has been exercise on almost or
clustwey by German and American sateronous re-

The French formal Le Radium describes a long series of experiment made by liken, of Rome, in regard to the presence of therium in various earths and rocks. The proportions of therium found expressed in millionths of the weight of the mineral, were as follows: Roman regetable earth; 14C, grantle from the Vosges Monstains, 897, granite from the Vosges Monstains, 897, granite from Lako Magair, 314, "attorns specimens of synalic, 520 to 528 forms, 314, "attorns specimens of synalic, 520 to 526 Gobard tunnel, gave the following quantities of thorough the synalic specimens of the principle of the Pri

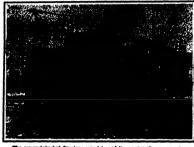
A NEW STORAGE BATTERY STREET CAR

ANOTHER EDISON INVENTION.

The announcement was made about nine years ago that Thomas A Edison would soon piace on the mar-ket a storage battery that would be much lighter and of greater capacity than the usual battery and pro-vided with positive and negative elements that would not deleriorate because in place of an acid an alkali would be used for the electrolyte Much was promised

showed no serious effect when rapidly discharged, and no damage resulted from overcharging Shortly after the batteries were placed on the market it was found that batteries were placed on the market it was found that the graphite became oxidized and interfered with the ontput. After considerable research it was discovered that chemically pure nickel could be substituted for

ous one. They had to be about the size of a lead pen-cil, namely, quarter of an inch in diameter and four inches long, with the sides intelly perforsted. A ma-chine was eventually built which made the tubes out of perforated nickel ribbon. The ribbon was wound spirally with the edges of the coils interfocked and fast-



The car weight but five tens complete and its construction repres a radical departure from common practice

Interior of the car with the scats raised to show the batteries placed in the steel girders. A NEW STORAGE BATTERY STREET CAR

for this battery, and a year or two later it appeared The positive element consisted of nickel oxide inter-spersed with layers of graphite and packed in perforated nickel tubes, while the negative element con stated of iron oxide and the electrolyte was potassium hydrate. Both elements were supported in nickeled nyurate non riemans were supported in negeted steel grids. The battery weighed about half that of the usual signage battery of the same canacity. It

liut soon another difficulty developed. The nickel was packed in tubes of square cross section and those tubes packed in tubes of square cross section and these tubes would buckle or bulge outsard, permitting the pow dered nickel oxide to filter down over the pure nickel isyers and insulate them Then it was determined that a round tube would have to be used which would withstand the pressure of the nickel oxide The prob-

amount of money was spent in solving this one pro-lem of the battery.

Shortly after the batteries were first put on the markst they were withfrawn on account of the de-fects above sommerated, and about two years ago when the battery was finally completed in its present form a large number were sent out to be tested on auto(Continued on page 132.)

ARTIFICIAL PRODUCTION OF THE VOICE

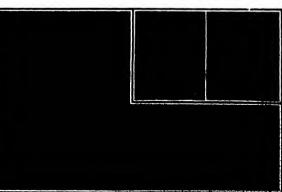
BY JACQUES BOYER

Dr Marage has succeeded in demonstrating, by nu merous experiments, that the voice results from an intermittent vibration of the laryax and the air with in II, reinforced by the resonance of the mouth and intermittent vibration or the larynx and the air with in II, reinforced by the resonance of the mouth and other cavities situated above the larynx in a recent communication to the Paris Arademy of Sciences, Dr. Marage supplements this demonstration by proving that the larynx alone suffices for the production of these vibrations In the first of

these later experi performed ments, performed on a living person Marage succeeded in nullifying the action of the hec-cal cavity by fill ing the mouth with 'sleut,' a substance which is used by ing impressions of the mouth The steut which filled the mouth was traversed by a ri gid tube which connected the lar-ynx with the externai atmosphere Al nant cavity of the mouth was thus suppressed, the five laryngian vowel laryngian vowel sounds OO, O Ah, Ay, and Ee, were enunciated distinct-

ly by the larvax The investigation was continued by endeavoring to profrom a larynx detached from the body Mutter had airwedy experimented with the dead and toolated lar directly experimented with the dead and toolated lar different from those of the living larynx, and he stretched the rocal cords by applying forces much greater than the museles of the larynx can exert These forces, which in some cases exceeded a weight of 24 pounds, vould certainly have torn out the sur-

noid cartilages of a tiving human larynx. Hence the conditions of Multer's appriments were shoomed Marage employed, in his experiments, the larynx of the dog In order to spars the animal useless suit of the dog In order to spars the animal useless suit fering, morphise was first danistated hypodermically and, three hours later, the dog was put under the influence of olilorotorum, and the larynx, with other largest and the spars of the control of the co excised. A rubber tube of the diam-



ARTIFICIAL PROPORTION OF THE VOICE.

ster of the trackes was then connected with the latter by means of a short tube of thin glass, so that a current of air could be forced through the The pressure of ured with a very sensitive metallic manometer graduated in millir which are ad for laba-

of by the largest by ambiting a drop and a high motion to, minimitally, the first man

WHAT SMOKELESS POWDER HAS MADE POSSIBLE.—I.

BY ROBERT G. SKERRETT

Recept for saluting purposes, where smoke making is a factor in the overmony, smokeless powder has supplicated the older propellature.

Our biggest hattlaships could not be given their present powerful armanusts had not smokeless powder made it possible to add to the destructive force of making the property of the country of the property of the calling for much less weight per unit of energy than formerly

unit of energy than formerly Emotheless powder was first generally used in the French navy at the time of the devolument of rapid fore guans to repell the writt tenyade hoat. The nes of smally guan powder in those weapons would have his-ness the development of the top-sold best first a genter chances for the top-sold best first a genter chances for the top-sold best first a genter chances for the top-sold best first particular to the top-sold best first a genter chances for the top-sold best first a genter chance for the top-sold best first particular to the top-sold best first particular to the top-sold best first particular to the top-sold best first first particular to the main to the differences between the physical actions of the old and the new propel-lents.

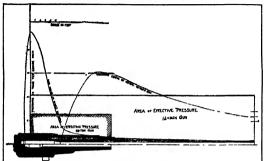
Black gun powder has a very dignified antiquity It is a mechanical mixture of saltpeter, charcoal, and aulphur Smekless powder, on the other hand, is a chemical combination in which the atoms bear a different and a far more intimate relation to one an-other Common gun powder is a violent explosive and

orean and a far more intimate relation to one an-other Common gan powder is a violent explority and observer, when harned in a confined space are only importestly reasured, and farge rotumes of smoke are generated. When used in guas the products of the combatton give about 60 per cent of propositing gases. These propularly gases have the double ber-form of moving the shall and this larest mass of smoke and the state of the state of the state of smoke and the state of the state of the state of smoke for the state shall and this larest mass of smoke charge was show that if the verified obtained the state of give the same ballistic results Illack powder required to the state of the state of the state of the state a very great and disproportionals stress upon the small and the mass thus sailly infamed. Our dis-small and the mass thus sailly infamed. Our dis-small and the mass thus sailly infamed. Our dis-gram above graphically the quickness with which the highest pressures are doveloped and the rapid way in

middle of these units se that as the consuming fame reduced the outer surface the burning area of the hole was increased, maintaining thus a relative bainare of ignited surface and giving a more regular and gradual

dealing with the briefest fractions of a second of time, but measurable intervals that mean excrething to the unance engineer

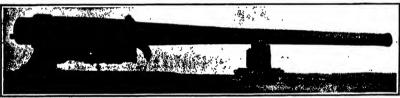
Higher velocities and better battistics followed But



SES tons SES tons SES tons SES tons

the old Armstrong and the latest 12-inch navy gur

reneration of sas. For a time, this answered But generation of gas. For a time, this answered But the gun grew, and the exposed surfaces of the greater powder charge required offered too large an initial burning area, and dangerously high and sudden pre-gures were produced at the breech of the weapon. there was actually more smoke than before, the bores of the guns were quickly fouled and there still re-mained a wasteful percentage of unburned grains Such was the state of the art in this country when we wont to war with Spain



Weight of sm. @ tens; Weight of shell, 140 pounds; Powder charge, 56 pounds; Examic velocity, 5,000 feet per second, Musale compy, 45,007 THE NEW 14-18CE, 45-CALLEGE OUR NOW UNDERSOING THAT FOR THE NAVY.

which they fail—the average propolates force being but a low percentage of the maximum power orylend it is this average pressure that most the shot on its seer is to have this reasonably high while lowering the creat of the curra of maximum energy. The first remedy tried was in the form of larger grains, so that, for a given weight of charge, the spec-ficial area at once exposed to the finne should be re-tained to the contract of the same should be re-tained to the contract of the same should be re-tained to the contract of the same should be re-tained to the contract of the same should be re-tained to the contract of the same should be re-tained to the contract of the same should be re-tained to the contract of the same should be re-tained to the same should be re-tained

duced—as power instead to going on what a maps flash burned more slowly, and the propelling force was better distributed along the bore of the gun. This method ted to the making of prismatic grains up to an inea and a half in diameter—regularly and care-butly formed. Next, a hole was bored through the

Besides this, a big percentage of the grain was blown out of the gun unconsumed Advance for a time was blocked until the powder makers evolved a "slowhurning" propellant by changing the proportions of some of the ingredients. The purpose of aniphur is to lower the ignition temperature of the powder, by lessening this element inflammation was more the element innamiation was momen-tarily retarded By increasing the charcol a greater percentage of moisture was added, and that served as a stoving-up agent in the general combustion of the mixture. The powder that developed was called "co-ons" because of its color—the consequence of the undermixture. In position of the under-coa" because of its color—the consequence of the under-charred charcoal used. In this country, we later called it "brown prismatic." The terms "quick" or "slow burning" are merely relative. In either case we are

Smokeless powder has quite reversed the task of the ordnance engineer. His aim now is to provide an ex-plosive which can be made to suit the gun rather than to fashion the weapon to meet the violent vagaries of the older propellants. Our present smokeless powder generates a relatively low regular, and progressive pressure from the instant of ignilion up to the timo the shol leaves the muzzle of the gun with its maximum velocity. The curve of our big 12 inth rifles shows how much nearer the powder makers have come to solving the problem, but much patient experiment-ing has yet to be done before the ideal is measurably

approached

The operative cycle of a shot moving along the bore the operative cycle of a shot moving along the hore of a gun in searcity opposite to that of a train of cars gaining full speed from a standetill tu the latter case, the engineer knows that he would endanger his cou-plings—even if he did no other damage—if he opeued wide the throttle at the instant of starting. So he begins by just acquiring headway and then gradually facreases the motive energy until the train has reach ed full speed—a matter of quite several minutes for a fast train and during a distance of a mile or two. The ordnance engineer, on the other hand, can give to his projectile only a flying start by suddenly applying a great and violent pressure, and enough of this propulsive force must follow the shell to the mustic in order to give the desired maximum velocity. This in order to give the desired maximum velocity russ must be accomplished within a period of not more than one-hundredth of a second of time and in our biggeet guns, while the shot travals a distance of not more than fifty feet A few figures will enable us to realize better the task set the ordnance engineer and



STATES OF THE PARTY OF THE PARTY OF THE PARTY OF TAXABLE OF TAXABLE PARTY. AND STATES TO STATE OF TAXABLE PARTY.

the part that smokoless powder plays in the result when measured by the power to strike an appalling blow The shell leaves the mazzle of one of our latest 12 inch, 45-caliber rifles, with a velocity of 2950 feet a second—13 52 miles a minute—and has a striking force at that instant equal to a blow of 52,632 foot tons' A fast express of 350 tons, thundering along at the rapid rate of 9834 miles an hour in collision with a standing object, would be able to deal a blow with a standing object, would be able to do it is blow of exactly corresponding magnitude. The gun's mis-alle weights but 870 pounds and the charge of powder 335 pounds, such is the power concentrated in our fees propellent and set so wonderfully resu lated is the development of this supendons enorgy that the weapon is actually less taxed than the older 125-inch rifle dealt with in the diagram while the

present-day gun has far more military value.

Referring to our diagram we see how far amokeleas
powder has mado it possible to improve upon the per-formance of the Armstrong gun of the "eighties".

That gun fired a shell of \$20 pounds, used a relarge of 130 unneds of black powder and gave to its shot a the shot left the gun it had a striking the ray of 10,980 foot tons. To day our hig 12 inch rities weighing but forty-old per cept more than the older weapon, can send their \$76-pound armor piercing shell on an errand of destruction with an initial speed of nearly 3 000 feet a second—delivering at the muzzle a blow nearly five times as great as that of the Armstrony gun. The '84 on gun with a powder charge acarcely more than a third of that now used, developed the dangerous maximum pressure of 24 tons to the square inch in the powder chamber Our hig "tweives" 365 pounds of an okeless powder-flavo a maxim chamber pressure in service of not more than 16 tons.
This means a reduction of stress upon the breach of the weapon of quite 33 per cent and yet yielding an average propulative pressure of something more than average propulative pressure of something more una-fol per rent greater, all because the present powder burns slower and oxerts its driving power for a longer period during the passage of the shell stong the bar-of the rife. It is the difference between the shock of a single, sudden, violent impulse and the better-sus-iained jush by which an object may be set in motion and acculurated

irely these are truly astonishing strides, and yet birusively have they been made from year to year that but few of us have realized their extent and their significance in strengthening our powers of de-fense and of retaliation. Buch are the echievements of loday. What may we not expect to-morrow? (To be continued)

A NEW UNITED STATES HAVAL GUN OF GREAT POWER. A REW UNITED STATES HAVAL OUR OF GREAT POWER. Our illustration of the new naval 14 inth gun can-not fall to oxcite widespread interest among those who are following the trend of development in the United States may The piece was constructed at the Mid valo Works from plans of the Bureau of Ordnance, and received its finishing touches in the navai gun shops at Washington it is now undergoing tests at the in-dian Head Proving Ground which are giving much satisfaction to the officers of the Bureau

ms to be a growing conviction ame of the leeding naval powers that, in view of the fact that future engagements will be fought at long ranges at which the remeining energy increases greatly with an increase in the size of the gun future dreaduoughts will be armed with a piece of larger caliber than twelve inches Great Britain is hullding, if she has not already completed, a 13½ inch gun, and our 14-lnch piece has been designed and is now being tested, with a view to putting our pavy in a pe to arm future dreadnoughts entirely with the 14-inch if it should be deemed desirable to do so

If it should be deemed desirable to do so
The new weapon, which will be 46 cuitlers in length
(that is to say its length will be 45 times the bors),
measures over all 50 feet \$\frac{4}{2}\$, inches, and it weight \$\frac{4}{2}\$
tons It fires a projectile of 1,400 pounds weight with
a charge of \$\frac{4}{2}\$ to pounds of smoothese powder and the
shell leaves the mustic of the grun with a velocity of
200 feet per second and an energy of \$6,557 boot-tons,
the contract of \$\frac{4}{2}\$ to \$\frac{4}{2 2,600 feet per second and an energy of 65,687 foot-tons. It will be noticed that the velocity is 350 feet a second iess than that of our latest 12-lnch gun, but that becau of the heavier shell the mussle energy is greater of the heavier shell the mussle energy is greater. The lower velocity has the great advantage that the pres-sures and temperatures in the bore of the gun will be less and therefore the creaton will be reduced and the life of the gun before the riding is so badly worm away as to destroy the accuracy will be conside The method of construction is somerally simi iar to that shown in the accompanying article entitled "What Smokeless Powder Has Made Possible"; and, except that the powder pressures are lower, the cur-of pressure from the powder chamber to the musa is approximately the same for the two ple

The telescope which is being installed in the Transvani Observationy will be the second largest in the British Empire it will be % feet long and have an apriure 26 inches in diameter.

The Borkefeller Institute's Work on Infantile Paralysis.

The psychic machinery in our body is made up of two systems—the cerebro-spinal and the sympathetic, the latter does not here concern us. The cerebro suinal system is made up of the brain, the spinal cord and the norves, which are derived from the cord and extend thence to the muscles, the skin, and the uttermost tissues. The basis of this nervous system is the nearone, composed of a cell body (gray matter), and its dendrites or fibers (white matter) which emanate from the ceil like the roots of a tree. The ne are sensory and motor, and infantlie paralysis is an affection of the motor neurone. The whole is like a tolograph system. The Shore (which make up the nerves) are the telegraph wires, the cell bodies (as grouped in ganglia) are the telegraph etations, com-municating by their fibers with the extremities, with one another, and with the main office in the brain

The sensory ganglis in the spinal cord, to which ensations are telegraphed from the surface of the ody, are in the posterior "horns", thence the sensations are transmitted to the brain cortex, from which in return commands are sent down through th ganglia, in the autorior horas of the spinal cord to the king the affected are

uscies working the affected area.

Infantile paralysis is known also to physicians as Infantile paralysis is known also to physiciana so anerior pationyvillis (police gray, sayolis, marrow—a term applied no doubt when the gray matter was erroncounts appead to be marrow, and tits, inflam mation). So this disease is an inflammation of the anticion horns to the applial court—those parts of the ord which are concerned in muscular movements and evelopment, and such a telon means paralysis, attrophy or degeneration in the particular my nervated from the part of the cord involved

nervated from the part of the cord involved infantile paralysis is generally an acute disease, and by far the greatest sufferers from it are little children from one to five years of age. Apart from the pathos in this circumstance, we would infer ought not, of course conclusively) the in though not, or column conclusively the infectious nature of this form of paralysis. For almost all the scule infections—measies, scarlet fever, whooping cough, and the like—are generally diseases of child hood, adults and the sged seldom contract them, if they have once contracted them in childhood, because the attack in infancy has conferred in most cases, lifelong immunity upon the individual Another rea-son for inferring infectivity in pallomyelitis is its frequently epidemic character, as in the summer of 190' when nearly the whole Atlantic seaboard was ewept, and again in the summer of 1909, when the disease appeared in New York and spread widely throughout

In perhaus two-thirds of the cases that have be studied physicians have concluded them to be infec-tious, though they could not prove this, in the remaining one-third the discase has been attributed to maining one-third the disease has been attributed to falls, to antecedent maturing fevers, and to homo-rhages into the spinal blood vessels. In the light of our present knowledge, however, it is safe to consider that such falls fevers and hemorrhages have not been causative of the pallomyelitis but rather preing factors making the tissues concerned vulner

ing factors making the tissues concerned values able to the essential or specific first.

The motor neurones in this paralysis become smaller, then they degenerate, liquefy, and finally shrivel up, the fibers emanating from them degen shrivel up, the never emanating from them degen crate and airophy. This process may go on to com-pleto destruction of these precious elements, or it may be arrested at any stage. If arrested early, re-pair may ensue and the cells and their fibers regain hairly well their normal condition and function in, unfortunately, the inflammation goes on, the size and shape of the spinal cord at the points involved are contracted and changed, and in consequence of this the muscles concerned become paralyzed, atrophic, and inexpalse of thele; proper function When receivery does lake place these muscles are up to remain small; perhaps throughout lifetime. These little patients suffer also retarded bone growth deformity of the points involved councitimes intered curvature of the property of the contraction of all the symptoms accompanying a fewer; there is a pain to the back and limbs; suddenly these a page of the contraction of the fatrix wall their normal condition and function

supervenes paralysis, generally in the leg muscles. A child may be put to bed seemingly quite healthy, and cand may be put to bed seemingly quite healthy, and may in the early moraling manifest these sufferings. The outlook is generally good as to life their, yet the severity and fatality of the disease, as in all infec-tions, fluctuate widely; and taking it uit nil, pallo-mysiltis is sufficiently diseasens to give medical men much anxiety, as it should give the community

unoral grave concern.

As intimated, the infectious matter of pallomyelitis as been rather assumed than pivoyfit it would now seem that complete domonstration of infectivity will recently be forthogoning. We may then ensertain the confident hope of a preventing the forthogoning when the preventing agent in the property of the preventing agent in the prevention of the preventing agent in the prevention of the prevention

against infantile paralysis akin to that which has practically eliminested smallpor from human experiences. Early in 1806 two German experimentary, Landsteiner and Popper, successfully inoculated two moders with the spinal corest taken from two fatal human cases of pallemyellits. In both the monkeys lasticas of the parallel of the contract of the c of the apinal cord were on autopsy found s

or of 1909 Dr Simon Flexi colleague, Dr Paul A. Lewis, of the Rocksteller Insti-tute, in New York city, obtained the cords of two chil-dren that had unfortunately died of pallomyelitis, in h cords the anterior horns exhibited th teristic grees and microscopic appearances. esthesis inconistion was made in the brain of these similans through a small trephine opening. The in-tected material consisted first of emulsions in sait solution of the two human cords; and later of emul-sions of the spinal cords of the monkeys that had desions of the spinal cords of the monkeys that had de-veloped paralysis after injection of the first emulsion, that from the human cords. The spinal cords in siz-series of monkeys thus inoculated showed without ex-ception lesions similar to those of human pallomysitis

Now a single successful incomistion with human iting in experimental pallomyelitis of establish the scientific case here set forth, because the result might have been due to a transferred toxio body, hat in the experiments of Flexner and Lawis the transfer of the active agency of opidemic infantile paralysis was regularly successful. In one series of seven monkeys the first inoculation was of human virus, the other monkeys were successively inoculated virus, the other monkeys were successively incommet-sach with the virus from the cord or the cortex of f predecessor, the disease regularly resulting. Hench by these and other equally conclusive experiments, or cannot doubt the infectious nature of pallomyelitis.

Again, later injections were made, not only in the brain of monkeys hut also into the abdominal cavity, brain of monkeys but also into the abdominal cavity, the blood vessels, into more substance (as in the sci-atic) of these animals Nor "can it yet be affirmed that still other avenues of infection (as the skin, the organs of respiration or the directive tract) do not evist for the entrance of the viens into the central is system

But now as to the nature of this virus which is re onsible for infantile paraiysis. It is at present in visible under the microscope. Flexner and Lewis after most exhaustive search, have found that it is after most examinative search, have found man it in meither a his terium or a protocon, which parasites have been isolated as pathogenic of most of the in-fections disease. The virus of infantile paralysis— its infecting agent—in of the same nature as that of smallpox, it belongs to the class of the minute and filterable viruses that have thus far not been desunstrated with certainty Newstheless, although the smallpox virus still remains invisible to us, for a com-tury past a veccine has been coviord from it by which we have practically banished this dreadful disease from the fare of the earth, there should then be no reason in science why a vaccine or an immunising agent against pallomyelitis should not now in

By the way, did the reader note in this paper the phrase "after other anosthesia!" It means that the monk-ys suffered no torture during these experiments, so benoficont in their trend for humankind Let us so concoron: In rear trend for numarized Let us congratulate ourselves that infamilie peralysis is an-other added to the long list of draadful diseases for which a remedy is being found through animal ax-perimentation, which could otherwise never have been

An Electro-pnonmatic Conveyor System for Libe

An electro-pneumatic system is used in the Berlin royal library for carrying out the distribution of bo to the readers Upon this system the reader fills out a blank containing the name of the desired book, and upon this blank an employee writes an exact indica-tion of the place where such volume is to be found. The bulletia is then sent by pneumatic tupe to the central office. This office is directly connected by ele-vators with the different stories of the building. These vators with the different stories of the building. These selections are of small sites and are operated selections to of small sites and are operated selections as a push-button system. Besides, there is ranporting persons and books. A set of pasumatic tubes also run from the central office to the different tubes also run from the central office who receives the reader's building sends the same by pasumatic tube to the proper foor, and on this foor the attendants read the shoet and bring the desired books to the slowator which takes them to the control office. This latter effect then easied to the control office. This latter effect then easied to the point from which the building speak in the first place, either in the nature reading room or any other of the rooms of the Bibury.

The production of merviry at the Almaden mines, pain, was 1,017,020 kilos, or \$6,472 findes, to 1904. At tiones it wist \$6,685 kilos.

Scientific American

Correspondence.

THE STRONGER AS A CLOUE.

To the Editor of the SCRIVITY AMERICAN
In regard to Mr. Baker's item in the January lat
number relating to the gyroscope not maintaining its relative to the earth, but relative to a fixed point in space, if this be true, the gyroscope, operated by a small motor and set on a balanced pivot, would ake an excellent timepiece, although slightly diffe en those in present use, make only one rev tion in 24 hours. The clock would of course have to et with the axis north and south, so the gyrosco would (apparently) rotate from west to east. It cou also be geared so as to denote the minutes and se onds, and would be absolutely accurate, with the ex-ception of the slight friction which would have the

effect of slowing the clock a trifle

It occurs to me also that the same principle might be made use of in maintaining the position of astro-nomical telescopes, if the vibration could be overcome, instead of the mechanical, clockwork devices now in

To anyone who has the inclination to experiment in this way, a timepiece of this character would make an interesting toy, and could be very cheapiy con structed. An ordinary toy electric motor should serve an inte the purpose of a gyroscope Edmonton, Alberta. CARL OFSTITUT

WHY DOES A WATCH-SPRING BREAK!

WET DOES A WATUL-BEARN MANAGE.

To the Editor of the Sciphtipis American

Why does a watch apring break after being in use
quite a while? If not strong enough, why did it not

break at the very be Such is the question propounded by the Editors of the Scientific American

Let us suppose a strip of iron to be fastened at one end, the other end being free if we bend it a little and then let it go it will return to its place after viand then let it go it will return to its place after vi-brating a certain length of time. It may do the same again and again, when we bend it more and more until finally after being bent boyond what is called the limit of clasticity, it will be permanently deformed Its molecules have then assumed a difficult position in regard to each other from that they had before

if we keep on bending it still more it will finally reak in two at the point where the strain is greatest or where a defect may exist

or where a defect may exist

Now let us try a good steel spring ilore we find
no deformation appreciable When we bend it be
yond its strength, it snaps at once At least it appears to be so The probability is, however, that a pears to be so The probability is, however, that a permanent bending takes piace first but at a point so near the breaking point that the difference escapes our observation entirely

observation entirely

Passing to the other extreme we will take a strip
of lead. There is then almost no elasticity, a very
slight bending will deform the plees, but on the other
hand, it will lake a considerable amount of bending
or twisting to break it

So much for the immediate effects of bending or otherwise straining any given material But now the question arises, what might be the effort of a strain not quite sufficient to produce an immediate deforma

tion, but sipplied during a long time?

I can give here an example that I have often the occasion to verify Take a piece of tin and a piece of ginc (in sheet) of the same size, bend them to some extent and fasten them Two weeks later release thom The tin will return immediately to its former shape while the zinc will remain bent just as it was

Or take a piece of tar and mut it on the table. It will keep its shape, and even stand quite a pressur-without deformation or breaking down Nevertheless in the course of a few days its molecules will have rielded to such an extent that the piece of tar has not even been able to stand its own weight, and has spread over the table

Now, what has taken place with the sinc or the tar htedly occurs with the other materia certain limits, at least it seems to me so. The piece of iron kept bent near the point of immediate deformation, must in a sufficient time yield and be deformed. tion, must in a summissit time yates and be deformed the watch spring, or other steel spring, kept best not quite amongh to break must in course of time break up. The continued tension of the molecules must have a tendency to displace them, and finally causes them to yield

We have an immense amount of information as to the immediate deformation or breaking of materials of all kinds under stresses applied at once or during a short time, but only very little concerning the effects a short time, but only very little concerning the effects of stresses applied during a long time. Several supposition capbes or bridge steel members have given may after years of service. The general option among singlesors is that the breaking was due to the witness channel for the trevel over the irridge. These fitting channel for the reverse in the capture of the reverse in the capture of t a a crestalline structure instead of the origi-

it is said that a watch spring is more fiable to break during warm than during cold weather I am very much tempted to opestion the correctness of that out

However it may be so to some extent at least in the first place, as a general rule the strength of all metals decreases with an increase of temperature Between the ordinary limits to which a watch is ex Hotween the ordinary limits to which a watch is ex posed, the difference is insignificant. But it is not so as to the expansion of volume. The diamoter of the barrel changes but very little, but the spring, being

carret enanges out very ittie, nut the spring, oving very long, expands out of all proportion in fact the increase of kagth of the spring is about twenty five times the increase of size of the barret That is the equivalent of placing the spring in a smaller barrol and increasing its tonsion and liability of hreakage in proportion

ADMIN GITAL

KROZVIK: TO Knoxviile, Tenn

SAFETY IN MINES. To the Editor of the SCHNTIFIC AMERICAN

in your issue of December 4th, 1909, in an editorial discussion of the Cherry mine disaster you state "the flames reached the dust-covered pine timbers of the structural work" This leads to a suggestion that the arructural work." This leads to a suggestion that the structural work in coal and other mines should not be made up of pine or other timber at all, but of fron or steel Also, from another part of your discussion I conclude that wouldaring shafts should be distinct m the holsting shafts.

In fact, the whole subject of protection to the miners should be studied out by scientific mining experts. The duty to protect the workmen rests as moral duty on the owners and operators of the mines and this moral duty is in need of legal enforcement by approprints statutes State and federal. The man are clearly priate statutes state and federal. The mea are clearly entitled to protection, and protection would in the iong run pay in dollars as well as lives. The whole subject of protection from preventable disastors—and most of them are preventable as in

disastors—and most of them are preventable as in generally discovered after the event—ane da to be made the subject of expert scientific study. The loss of tife and limb due to accidents in mines, in railways and to burning factories theaters school houses and hotels is appallingly great, the more so when much of it, most of it, is clearly preventable. But right here it must be emphasized that too much reliance is had on mechanical signal systems and has links signals on railways and the like No mechanical system can ob-viate the need of emplementary personnal human vigil lance. There must be still the human watchman to supplement the mechanical system. Mechanical sys-tems have their advantages—the advantages of au-tomation. But automatics meets the aid of human intelligence and vigitance. There is no little vature placed on human life the lives of workines, of the placed on human life the lives of workines, of the elers of the appearance at the play, of the children in the great invoked who houses. The man who we must be emphasized that too much reliance is had on evers of the speculators at the play, or the children in the great trowded school houses The man who seem his loved once start on a journey is likely never to see them again, or at best for worst) their charred, almost unidentifiable remains Or it shay live, it is to be maimed, disfigured cripples. Or the man him self may be stricken in his prime—the untimely vic tim of a lack of care or of undervaluation of human Or the president of the railway system -as he happened more than once in the last decade nappened more than once in the last decade—may himself become the victim of bis own neglect and may ride to death in his palatial special The whole matter of accidents is in a condition un

The shole matter of accidents is in a condition unverthy of the intelligence of the country. For one thing, there is lack of contant inspection—eternas in specific, day and light the respection, day and light the properties of the second contains a second contains too much out of consideration, as if they were mere "sports" of Nature, mere chances, whereas they are the certain and inevitable and hence preventable resnits of well known factors—factors of wear and tear. factors of growing structural weakness in timbers and steel, factors of ever possible congruity of unfavorable idental coming together of com circumstances, the in hustible elements etc.

in hotels it must be assumed that fires are likely in hotels it must be assumed that fives are likely tappen at any or all times, and there is need of the eterral vigilance of a sofficient number of trained herizan to keep the whole area of danger under intelligent surveilance. Mechanical appliances should not brogarded as a substitute for these litting impectors but marriy aids. For the automatic system has a hat merely aids. For the antomatic system has a canny, numechanical way of getting "ont of far" at the worst possible time indeed it can be depended on to do this very thing. These observations apply to railways, mines, and factories it is not sufficient to have a jury determine whose negligence caused the positions or to say that it was due to some imperfection in the antomatic signals Prevention is the thing Think what horrible deaths—deaths of scalding, burn-ing, crushing, malming—American men, women, chil-dren and babes are dying aimost hourly The sick-ening scene is familiar—the 'unlooked for accident the sending for the nearest village or town surge the "carting away," the "shoveling up" of the mangied remains, the borrible identification of charred remains hy some jewel or scrap of a shoc or fragment of ap-parel Prevention is the thing through expert sci through expert sci ontific study and adequate justicition. The authorities of enough importance to warrant it being taken up in the great universities and technical schools, so in the great universities and technical schools, so that men could be trained by proper study and prac-tice to take charge of the important work of saving life by preventing accidents it would be a noble and useful work, if achieved—and it can be achieved lializada or railways systems should have a deps ment with a trained corps of meu to cope with the conditions out of which accidents arise. At its he At its bead a competent man, not to operate trains, but to remove the dangers of accidental death sure to arise when all are bent on running the trains on schedule (as now) and no one is thinking particularly of the human fives entrusted to the rallways system, these dangers would be greatly minimized if the right stees are tuken There is a rallway west of the Mississippi Rivor that has been operated for several decades, and it enjoys this unonviable distinction. The road has never caused a single human death i have beard of a steamship line that has never lost a pass ditions were general bow much happier overybody would be ger's life

Fellow American Association for the Advancement of

Protein View Tow

Ephraerides of Inness' tomet,

In order to determine carry positions of Comet 1910 s on photographic plaies, the following ephome-ris has been computed by Prof O C Wondoll from Kebaid s element, given in 14 13 383

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10 10 The turrent Supplement

The great bridge over the Red River in indo-China is the subject of an aritie which opens the Current Supplement No 1779 Mr Richards explains some principles in design of friction clutches A new valve gear for gas engines is described and illustrated. automobile chart has been invented by Mr Joseph J automobile chart has been involved by air Joseph J Jones which serves the functions of a unchanical sign post Briefly it invention is a revolving card while tells the driver or any one in a car exactly where he heppens to be upon a road. An article on the German "Dreadmughts' of the 'Nasseu' type is published A Lettermoser discusses the present state of physical chemistry in collects. Dr. G. Hudson Meknen. physical chemistry in colicids. Dr G Hudson Makma writes on sismar-ling and gives some suggestions as to modern methods of remedy. J T (multiphism artics on frantormulous and migrations of reis Most of m have probably never learn of Nicolo Orome, yet he was the forernues of Clopernius Prof. Pierre Durham does credit to his work in an apprentiative article. A very exhaustive article on the Paris tunnels will be found in the Strevews, an article of peculiar indirect in level of the recent insudation. of the French (Bultal

The depth of the water in the middle of the Berlin Stettii Canal will be a meters 1984 feet), and the breadth at the surface in ordinary soil 33 meters (1882 feet). In soft peary ground it will be from 37 meters to its meters (1214 to 1246 feet). For a distance of 16 miles the bed and benks of the canal will have to be puddled with clay, the surface of the canal there being above the water level of the surrounding country. At one point the canal crosses the valley of the river by an embankment provided with a culvert 160- miters in institut The eleven locks for the descent into the Odor Valley are begun One of them has a fail of 9 meters (2955 feet! The questim of building a lift besides the series of locks has not yet been declared. The 37 canal bridges are all to be built of stoel

CLEARING SNOW FROM RAILWAY TRACKS IN CANADA.

BY FRANK C. PERKINS.

The accompanying illustrations show the construc-tion and operation of a novel cylinder snow plow de-signed and constructed in the Province of Ontario signed and constructed in the Province of control
When the plow of this remarkable machine is forced
Into a drift or cut, the snow is lifted by the shovel,
which is inclined upward and meets the expeller charabers, the snow gliding along until it comes in contact with the expellers the blades of which revolve at a with the expellers the blades of which revolute at a high speed in an upward direction Engaging the snow the bindes throw it neward and outward at a great velocity, delivering it to a distance of 50 or 60 feet on each side of the plow and making a cle

feel on each side of the plow and making a clear or if feet in width and at a speed of 8 to 8 miles p hour in a cut 10 feet deep. The snow is elevated and thrown at so great a cleatance from the track it the possibility of the smallest grant the track in the possibility of the smallest grant the track in the possibility of the smallest grant the previouded. The snow does not onier the experience and the stated that the maximum velocity of the expeller blade at the periphery is 5654 feet

The accompanying litustrations are front and side views of this remarkable cylinder snow plow in one view the snow expellers anow plow in one view the snow expellers are shown in operation, in another a cut 12 feet deep is illustrated. The reader will doubtless not the impression which wedge and aprof. leave on the snow. The thin end profe is only 20 in he shead of the expeller.

Other Illustrations show the cleaned track Other limitations show the cleaned track in a ten foot cut, and the machinery within the plow car, including the boller sleam pipes and engine. The expellers are directly connected with the engine shaft by means of two stoel chain belts

It is stated that each of the steel chain belts driven by the steam engine of this plow is capable of driving the expellers at plow is capanic of criving the expetiers at a moderate speed alone, so that should one belt be disabled the plow would still be able to work at a somewhat lower rate of speed The plow body is of steel construction th

e box portion having the sides envered with wood ifk a box our The roof is of similar construction, which is fire and water proof A door is provided on each side in the middle of the car, the back end being left open for convenience in stoking the boiler A lookout is built at the front and of the car from which

point its engineers can be signalled to
The from and
the car, entirely of steel, has three
chambers, inc two wide once being circular, open at
the front and one side, in which the expellers revolve These are the foot in diameter and three feet six inches wide. Each expoller consists of a cast from hub upon which are formed four spiral fanges, hav-ing a pitch of shout fourties feet Riveted to these flanges are four half not steel plaine or blades twenty iwo inches wide comprising a true heliz upon the hub. The expellers are mounted upon each end of the shaft and overlang the pedestals the shaft ex-tending into the circular chambers. On the middle of the shaft, which is eight inches in diameter, is keyed the aprocket wheel, which is connected with a similar wheel on the shaft of the engine by the steel chains. ese four paris constitute the drive gear The mid die chamber opens in the interior of the car On the ent is constructed the nose of the plou, consisting steel plates projecting forward to the end of the of steel plates projecting forward to the end of the apron or shovel It may be stated that the apron or

shovel is attached to the bottom framing, the side plates, the interior web plates, and the expeller cham-bers, by steel angles and plates. This apron articles forward five feet beyond the center of the expellers. The nose and shovel, being firmly riveted together, present a rigid construction to engage the snow.

This powerful cylindrical snow plow has engines occially constructed. The cylinders are sixteen specially constructed. The cylinders are sixteen inches diameter with eighteen inch stroks and work inches diameter with eighteen inch stroks and work under a steam pressure of 150 pounds per square inch, the maximum speed being two hundred revolutions per minute They are capable of developing 750 I H. P. and are piaced as near as possible to the expellers

But and a second second

A view showing an expeller.

to shorten the drive chain. The engines exhaust into the bottom of the amoke box of the bolier through a sultable nessie similar to locomotive practice, creating a strong blast.

Hardening of Boft B

Mr A. Kubelka of Bushowits in Moraira has discovered a process by means of which the softest sand-sione or limestone can be made hard. The process is the following. First, the surface of the stone must be thoroughly cleaned, so as to expose the pores. Any be thoroughly cleaned, so as to expose the pores. Any oil or grease spots must be removed with bensize or with the alcohol fiame Missing ploces must be filled up with cement mortar, using a 1 7 solution of water-glass for tempering After the stone is thoroughly dry, it is saturated with a solution of potash or sociawaterglass in case of rain during or immediately after this operation, the stone must be again cleaned, dried, and saturated with the solution. Then follows an impregnation with molten chloride of calcium After this impregnation rain will do no more harm as on account of the reaction of the chloride of calcium upon the solution of watergians, the pores of the stone will be filled with insoluble, hard silicate of time, while the soluble silicate of time will be decomposed and washed out by rain Another metho of Kubelka'e is to saturate the stone first with a solu tion of suiphate of alumina, in water, and when

with a solution of potash wakengless. Sensetimes a repetition of this process will be necessary to there excited the first state in a startaste to a death of about \$6\$ inch. State of the state in the state of the present of the state of th

soft atones—cheapness of quarrying and cut-ting—remain, and they can receive after-ward all the prominent qualities of the barder stones.

Mortar and concrete may also be h Mortar and concrete may also be hardened and compacted by these processes, so that they may be used with greator success in works calling for water-lightness, as water works, tanks, street pavements, sidewalks, artificial stone, coment blocks, etc

Monuments can also be protected by thee processes from the influence of the weather

of Removing Hair fr

An article in the Ledertechniache Rund-schau mentions, without describing in de-tail, a new process for the removal of hair from hides, tail, a now process for the rumoval of hair from hides, in which the agents commonly remjored for this purpose (lime, sodium sulphide, etc.) are replaced by rasitable gas, which effects the rumoval of the hair in from two to sight hours. The process is said to be opecially valuable for the preparation of colored isather and fine leather in general, as the product is of very uniform grain and free from the spots which are often processed by ilms and sodium sulphide. The leather is also much closer, foughts, stronger, and reaser is also muce closer, congast, stronger, and more forsible than leather made by the usual methods. Hides treated by the new process may be tanned with bark, astract, or chrome alum. The inventor, whose address may be obtained from the journal quoted, will furnish detailed information to persons interested.

The Coming Aeronautic Show at Bo

The Centing Accountle Show at Beston.

The first Accountle Show to be held in the United
States without connection with any other exhibition,
will open in Mechanics Building, Boston, Mass., on February 16th, and not on the 23rd, as announced in our last issue. This show will remain open one week. So enteen full-sized aeroplanes have already been so rured, and the exhibition promises to be a repres tive one as far as the heavier-in-near machines are concerned The manager can be addressed at 5 Park Square, Boston, by any experimenters having machines







Front view of plots. GLEARING SPOW PROSE SATEWAY TRACES IN CANADA.



Plow withdrawn to show house of ord.



BERNARD PALISSY, THE FAMOUS FRENCH POTTER, AND HIS WORKS

BY CHARLES A BRASSLER

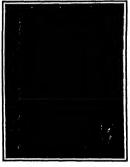


Bernard Patieny, whose statue by Barrias appropriately graces the court yard of the Ceramic Museum at Bèvres, is one of the most interesting figures in his-

Bevres, is one of the most interesting figures in history
Born about 1810, near Agen, now in the department of Lot and Garcanas, France, he was apprenticed saffy in the to a potter, and interested bisential grace and the saffy of the saffy

An enameled cup of fatence which came into his hands inspired him with the determination to discover a method of producing white enamel, and for nearly sixteen years, neplecting nincate everything isle, he devoted his time and attention to investigations and experiments in this direction. During this period, agreement in this direction. During this period, game, etc., that isld the foundation for he future stances. He first attempts were nancoessaft, but first attempts were nancoessaft to be a pursued his researchee with unparalleled persistence and energy, scarfiching entrything to what the cought him no profit. He exhausted all his resources, and lacking fuel for the firing of his kitins,

was reduced to the necessity of hurning piece by piece his household furniture. Ridiculed by his neigh



Portrait of Pallmy. From an old French miniature on welltun at Cluny.

bors, bitterly represented by his wife and tormented by the cries of his hungry children, he nevertheless persevered until finally, when reduced to the last desperate carrentites, success rewarded his efforts. I'nlike most of the investigators and experimental

If alike most of the investigators and experimental sits of his time, Palisay had conducted his inbors agreematically, and when he attained his object, he was able to repeat his work and obtain the same results. A few vessels, ornamented with life-life represents the control of the control

note, for Pallary had embraced the reformed faith.

A man of studious habits suited in tricilizance.

Pallary was among the earliest of French scientists to substitute for the faith and faintful theories of so-called philosophors, hard facts, that were capable of practical demonstration in 1675 be commanded the dolivery of a course of lectures on natural history and physics, in which he gave a correct account of the origin of springs, the formation of stones and the origin of springs, the formation of stones and the methods of puritying valery, the use of mari as for Continued on some All 10.



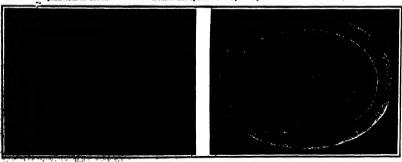
A cup and pitcher made by Bernard Palifey and new preserved in the Leuvre.



Palisey's reproduction in pottery of one of Briot's masterpieces. The Temperentia plate.



Pitcher belonging to the famous Temperentia basis and two candlesticks, all in the Lenvre.



Large platter embellished with regulies, Schoe and shells made by

"La Belle Jardiniere," a famous plate by Palinay preserved in the Cluny Museum.

AMERICAN PARTIES, THE PARTOE PRESCR POTTER, AND HIS WORKS.

Scientific American

THE REAVERS IN PRESVARY, 1910



iksT among the astronomical discoveries of 1910 is that of a brilliant comet reported from South

At that time it was but five degrees south of the sun, but it degrees south of the sun, but it was so bright that it was visible in full daylight to the nusled sye, and observations of its spectrum, made next day at the lake Observatory, showed the sodium lines bright on a coctinuous proving that the comet was very

This doubtiess means that it was then your Dear

This doubtiess means that it was then you no sun, and strongly heated by its radiation

From the scanty information which is yet avail able it appears that the comet is moving rapidly north-eastward and dininishing in brightness. Its orbit has been computed and ephemeria with be found on page 123 of this issue it is probable that it will be visible for a few weeks in the evening sky, just after sunset. and almost directly above the point where the sun disappears. It is, however, quite possible that it may

lose so much in bright ness, as it retreats from the sun that it will not be very conspicuous. On the other hand, it may be a fine object, and the eve-ning skies will be well worth watching especially about the beginning of uary when moonlight no ionger drowns out faint objects.

Halley's comet is still visible in the evening sky and is very slowly increas-ing in brightness, but it will probably be too faint for the naked eye, though perhaps visible in a field glass.

It will fortunately be easy to locate Just north of the planet Saturn are three stars of the fourth magnitude, in an cast and west line On February 5th the comet will be about 50 min of arc (or, roughly, one and a half times the moon's diameter) north of the middle one of these stars, and on the 17th it will be about the same distance north of the westernmost of th Hy following this three ! line of motion it can easily be found at any

By the end of the month it will be pretty low in the west at sunset, and soon after it will yanjab in the twilight, to reappear, much brighter, in the morning sky in April

While the appearance of these comets is exciting so much interest, a notable advance has been made in

the explanation of these phenomena. Observations of the spectra of the last two bright comets (Daniel s and Morehouses) showed that the light of the tail con sisted almost entirely of bright bands, given ont by some jurninous gas. But at that time no mas was some furninous gas. But at that time no gas was known which gave just those bunds. Very recently Mr Fowler of South Kensington, England, has found that a vacuum tube, centaining small quantities of nitrogen, and of carbon compounds (cardied electrically so as to glow), shows a spectrum exactly like that of the comet's tails, provided the pressure of the gas is made exceedingly small

As the pressure and density of the gas in a comet's tail must be atmost incalculably less than in any vacuum which we can produce by mechanical means, titls gives us a satisfactory explanation of the observa-The luminous particles though so thinly dis tributed th buted through space, are molecules of familiar els has been cleared away

THE HEAVERS
The splendid and familiar winter constellations a

ow seen in all their giory

Due south and about haif way up the sky is Orion The very bright star below him to the left is Sirius. West of this, directly below Orion, are the small groups of the Hare and the Dove. Far below the latter, on or Missouri can see a star of except This is Canopus, the principal star of the great con stellation Argo, and, next to Sirius, the brightest in the beavens. This star's brightness might make us the beavens. This star's brightness might make we anticipate that, like Siriue, it might be a near neight bor of ours in space, but repeated and careful observations show that this is not so its distance is too great to measure accurately, but it is at teast ten times as far off as Sirius, and probably much farther times as far of as Sirius, and probably much farther from us. Canopus must therefore be really a most magnificent iuminary, exceeding our sun at least a thousand fold in brightness.

To the left of Orion and Taurus are Canis Mis To the left of Orlon and Taurus are Canis Minor and Gemini, and right overhead is Aurus, with the bright star Capella. In the southwest there is noth ing of much interest, but in the west we see two bright objects, one above the other, not marked on the map These are the planets, Mara and Saturn, whose motion among the stars makes it impossible to put them in our permanent make of the heavens Mars is higher

up than Sature, and is redder in color

in the northwest we see Andromeda and Casslopeia, and above them Perseus. This is another of the con-stellations which bears no real resemblance to any-

da 9 o'uluste Prin il-da 195 o'uluste: Prin 14: An 3 o'uluste: Prin 15: At \$54 o'clock Famoury 10

MIGHT SKY: JANUARY AND PERRUARY

thing in particular, but with the aid of the drawing in our initial it is possible to see how the ancients found here the figure of the here carrying the head of the Gorgon Meduas, which is marked by the bright star Aigol

star Algol
The bright spot in the Milky Way, between Perseus
and Cassiopeis, is a spiendid star cluster, showing well
in the smallest telescopes.
To see how the northern constellations appear in

To see how the northern constallations appear in the sky, we must turn our map spatied down, so that the words "Northern Horizon" are at the botton. It will then appear that Cuphens to below the Pois, on the left. The Littie Hear hangs by its tail from the sight and only his tail showing. The Great Bear is climbing up the heavens to the seatured, and as laredy high in the east in Lon, pretty well up, and above is Cancer, with the star cleater Prassage. Firs-ther to the right is Hydra—an immessee constriction, whose head is already high while its tail will con-tinue to drag their live shall for three hown league.

Mercury is morning star throughout the me is unfavorably placed south of the sun. He may be best seen about the 20th, when he rises about 5-46 A. M. Venus is evening star until the 12th, when she passes between us and the sun and becomes a morning star. At the beginning of the mouth she is easily wishin in the avening, setting more than an have said a bid later than the sun, and at its end she is similarly conone in the morning skies.

During the middle of February she will be invisible to the naked eye, but as sha passes almost 8 degree north of the sun, she should be observable talescop-cally, in full daylight, as a thin crescent, all through

Mars is evening star in Aries, remaining in sight 1111 n

till nearly midnight.

Jupiler is in Virgo, rising about 19 30 P M, at the
beginning of the month, and 8 30 at its close.

Satura is evening star in Floreon, setting about 10
P M in the middle of the month.

Uranus rises only about 1½ hours before the sun,
and is nunbservable.

Neptune is in Gennini, observable all the avening,
but only with a good-stast tenscope.

THE MOON

Last quarter occurs at 6 A. M on the 2nd, new moon at 8. P M on the 9th, first quarter at 10 P M on the
17th, and full moon at 8 P M on the 23rd. The moon 17th, and full moon at 3 P M on the 23rd. The moon is nearest us on the 12th, and farthest away on the 28th. She is in conjunction with Urahus and Mercury on the 7th Venus on the 9th, Saturn on the

13th, Mars on the 15th, Neptune on the 20th, and Jupiter on the 27th Princeton University Ob-

servatory

The Library of the Amy-

During the interval of the past fifty years twenty the past nity years twenty thousand stone tablets, ap-proximately, of the library of the Assyrian king, Sardanapalus, were found the course of excavat nd in among the ruins of Nine veh and taken to London The texts written on them, which are related to one another apparently, are now published in their original cuneiform script by the British Museum In serial collections Varions have therefore an oppos innity for further investi n of the texts their special province, for avery kind of text in cuneiform script presents its to the translator and com to the translator and com mentator In the four-teenth collection, or vol-ums of the work are as-sembled those tablets of the kings library which regard chiefly the objects of the three natural king doms. Obviously many of these lists were prepared for purposes of marine

For this reason a prom-inent physician, Baron Oefele, assisted by noted

scholars in cunciform cript among them Prof Einmern of Leipzig, began to examine this collection with a degree of seal that has become quite prolific. Apart from the many lists which mention minerals, the numerous lists of animals are mostly of a uniform kind The names of animals are arranged in two collumns, the same names being are arranged in two columns, the same names being given in the first column in Sumerian and in the sec-oud column in Accadian, that is, in Habylonian 18111 far more interesting than its soological lists are the botanical lists, of which there is a given number, and botanical lists, of which there is a great number, and which give the most various directions to exquain the aspiring physician with the effect and use of hundreds of medicinal plants. This fact may suffer to be about that among the old Rabyinosians the knowledge of the natural sciences were already for greater than among their successors, the Greeks and Romans, whose names of atminist and plants, it is markined, here been de-rived partly from the Babyinosian language.

The shortest track for steamers from Panisps 19 Yokokama, Shanghal, and Henghong poince in deep proximity to Ban Leina Bay, eatr Cape Han Leina, at the southern end of Leiver Chilfernia, and to the ports or Manusatite and Acapulco on the against and Maxado. Perhaps Manusatile about the ragarded as

Scientific American



MRTHOD OF BOSNOWIELDS GAS. BY A J JARNAS

How to economies the consumution of gas for Humi-

tow to economise the consumption of gas for illuming and heating purposes is a question of consider the price charged for cost gas at the present time in many towns and cities



SECTION OF THE GAS

many towns and cities is so high as to prevent its use for coc' 'ng pur poses. Only b exercis-ing the utmost econ omy in using only just enough to rook the small quantity of food required does the use of gas for cooking become advantageous undor such conditions. By means of a simple

apparatus the heating qualities of the gas can be improved so as to reduce cooking ex penses and the cost of lighting as well, for in

Welsbach and kindred lamps it is the heat of the hurning gas that renders the mantle brilliantly incandescent Moreover the lamps it is the heat of the hursing gas that renders the mattle brilliantly incandescent Moreover the sighting qualities of the gas are gravily innuvered as the highling qualities of the gas are gravily innuvered as the highling the property of the property of the property of the season of the s

cylinder C six and a half in hes long and three and cylinder C six and a haif to hee long and three and on-haif inches diameter is soldered all round to the cone top of the cylinder A and is provided with a sper-forance bottom control to allow the hydrocarbon with which the economier is to be thereof to run through and saturate the rottom wanta D The cylinder C acts as a spreader, causing the year which enters by way of both the control of the cylinder is an expension of the cylinder is and both by the quantum the property of the cylinder is and con-trol the cylinder is an expension of the cylinder is and out through spice P The apparatus is charged with bounder, granificer or a similar, valsitic before each out through pipe F The apparatus is charged with bensine, gosoline, or a similar volatile hydrocarbon bensine, gasoline, or a similar volatile hydrocarbon capable of being taken up by the nonlinuminating con sittuents of coal gas, such as hydrogen, marsh gas or carbonic oxide At G is a suitable brass stop-cock which enables one to turn off the gas when charging



A 100-LIBER AND A 10-LIBER GAS BOODORIEER

the apparatus with gasoline. The brass cap at B much have a filth of pillable leather fitted in the interior to that it becomes periodicy gas-tight when accreted during the meaning the secondary to make a hole in the supply type B at B as that in case the gasoline should cover the bettern of the birdy type this would prevent any fishering of the birdy type this would prevent any fishering of the light A to building of the gas through the light A.

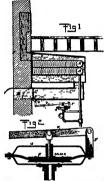
The charging of the apparatus must be carried out in daylight, and it should be fitted near a window where daylight is admitted, for a lighted match, candle or lamp must not be used. With these simple present into the prefetty and the cope too must be perfectly soldered where the incrination meats, and all the brane connections attached to the intet and outlet pipes must also be perfectly soldered indis rubber pipins or consectors must not observed in the contract of the co ordinary naked burner will be vastly improved
It has been found that half a gallon of benzine will

take the place of 500 cubic feet for direct illumination in this apparatus

The cotton waste in the economizer must be packed The cotion waste in the economizer must be packed moderately tight. If packed too loose it will slak and give less surface for the gas to reach the gasoline. Bo sure and mark the outer end of the inlet pipe 1N. This will prevent any mistake when installing the

REGULATOR FOR INDIRECT AND DIRECT-INDIRECT STRAW REATING BY B A JORD

Every indirect and direct indirect steam heater should have some kind of a regulator so as to shut off the air supply when there is no heat in the radiator, otherwise, especially at night when the steam pres-sure goes down and the air box remains open with the



REGULATOR FOR INDIRECT STEAM MEATING

old wind blowing directly into it, it will soon rool off

The accompanying lijustrations show a very simple way to make such a regulator Fig 1 shows the gen eral arrangement of an indirect heating radiator, and Fig 2 shows in detail the regulator

The radiator A is inclosed in a box in the usual way taking its air from the outside through the passage B and having a sbutter or damper C mounted to turn in suitable bearings on a shaft. The latter has a small bell crank D secured to its outer end which through a bell crank P secured to its outer and when turvens we link is connected to a levoy E. The lever E is plotted in suitable brackets P fastened to the regulator G. The regulator can be made of two small frying pans or skillets say about 5 inches in diameter. A part of the conical rim is bent outward forming flanges for boiling the same together. The bending is done very easily. Place the skillet over the edge of an iron block, and with a fint peen hammer attreth the edge, say about \$\frac{1}{2}\$ in the peen hammer attreth the edge, say about \$\frac{1}{2}\$ inch all around To the lower head, rivet a small floor fange, which will herve for counsetion with the atsamptive from the bolier in the center of the upper head a hole in made large amount to receive a hair lach nipple. To the lever in fantened a

ceive a haif inch nipple. To the lever is fratened a short red which passes down through this nipple to the dispirings H.

The dispirings H and of after rubber, say 3/16 inch thick with one or more layers of duck in it. To the top and bottom disks of from with heavied each state of the layer of the paper disk is soldered a haif inch hipple or pleer of pipe, serving as guide. The whole is now pieced between the two beads of the regardate and haif discrete very relationship To the lower head in factored the usual siphon pipe to prevent the statem from onlying the regardate of the prevent the statem from onlying the regardate of the statem from onlying the regardate.

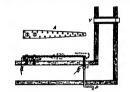
to prevent the steam from entering the regulator. As the steam pressure rises it will force the diaphragm

upward, thereby opening the shutter C in the air passage B, permitting the cold air to pass under and through the bank of radiators, thereby heating them there up through the registor into the room and will these up through the registor into the room and will keep it open until the sleam pressure goes down. The weight of the arm E will then close the shutter por mitting no more sir to pass until sgain opened by the steam pressure. A weight may be attached to this lever, so as to close the shutter more effectually

THERMOSTATIC ALARM FOR HOUSE HEATERS

The accompanying diagram shows how a simple tarm for house heaters can be made

The object of this siarm is to give warning whou the farmace is overheated and needs attention, or when the fire is nearly out and needs more cost. A there static bar A 11/2 inches by 1/16-inch is made



THERMOSTATIC ALARM FOR HOUSE HEATERS

and from rivered logselber very closely and fastined at one end are branches if which nor secured to a suitable base H. The free one of the har A movre between two contact points in made of ordinary accretelyer. There are acressed into posits i' made of ½ linch dowel and secured to the base H. The whole is fastiened in an inverted position over the times of the prize where there is danger of the internation of other place where there is danger of con-tecting After the contact points are adjusted to close the circuit at the proper temperature title; are con-nected up to an electric bell and interty as indicated in the drawing and iron riveted logother very closely and fastened at

in the drawing

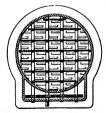
A switch is placed in the circuit at some convenient A switch is placed in the circuit at some convenient point. It will now be seen that when the thermosistic bar B moves to either side, according to the tempers ture and makes connections with coninci points D the bell E will ring When the apparatus gives the necessary starm the switch must be turned off until the trouble is remedied

ADAPTING A SEATS FOR SEALL COAL.

BY 1 A SEASON

The graies in the ordinary bouse hosting furnaces
are regulated and made for the best and most suitable
sits of roas in to be used in each particular case. That
is to say in a large localer farmace where age coal is
not sailable, a very cames and open grate is previded but to a smaller formace where smaller coal be
to be used, a must be formate.

in some localities where pea coal is much cheaper than egg stove or nut it would perhaps be more eco-nomical to hurn the pea coal provided the grate would permit. As a rule, if the pta coal is used in these large furnaces it has not proved very successful on account of the coarse grate, unless a new one is put in more suitable for the smaller coal as the shaking of



SPATE ADAPTED FOR BURNING SWALL COAL

the old grate will cause the whole fire to dump into the

To overcome this the writer has tried several meth-

To overcome us to writer our rived sweet incur-ods and has come to the conclusion that the best is that shown in the accompanying illustration. The grate is an ordinary rocking finger grate. Be-tween every or every other finger (which will do und upon the kind of grate and also of the size of cost to

There should slways be a layer of an inch or two f ashes on any grate Care should be taken not to shake the grate too much, as a great deal of live coal will fall through and sometimes start to burn in the

ash pit thereby warping and destroying the grate bars.

The writer has used some old pipes and grate bars for a number of years and to-day they are as good as new Some years ago, during the coal famine, a great deal of bituminous coal was burned with perfect success it is but when starting a new fire to clean out the ash pit and if any live coals fall through they may be showled up on the fire again until enough are formed to prevent them from falling through

HOW TO BURN COAL ECONOMICALLY ST W B ALLE

The accompanying illustrations show how in a very simple way the gases in an ordinary furnace may be simple way the gases in an ordinary furnace may be consumed and burned thereby giving off a more uni-form heat and maintaining an even temperature throughout the house continuously night and day it will effect a saving on the coal bin and produce more

ited besides

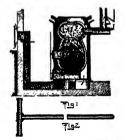
The fire in a stove or fernace is simply the result
of a chemical union of the carbon properties of the
fire i both solid and gaseous, with the exygen of the

ily the complete combustion of one pound of coal 14,600 heat units are given off, but by the incomplete combustion of one pound of coal, as burned in the great majority of domestic heaters, only about 4,000 to 5,000 heat units are produced and the balance of the to hoo heat mits are produced and the balance of the hoat passess away up the chimney a rich combustible gas that should have burned

To obtain the highest efficiency from coal it must be hurned with the icast possible supply of air con sistent with perfect combustion, as an excess of air carries the heat of the fuel lute the chimney and a certain mixture of air from below the grate will cauan explosion in the smoke pipe blowing the fire door open and filling the cellar with spirit gases. Nearly every furnace discharges so-called "coal gas

which is due either to poor draft or a defective fur nare, or an improper adjustment of the dampers. As the odor is so noticeable, the difficulty is soon reme died Every furnace hewever, is constantly discharg feetly odoriess and is a very energetic potson, as the it of imperfect count suit of imperfect combustion
Ordinarily the domestic user of coal reasts out the

Orannerity the dampers and drives it up the chimney gas, mens the dampers and drives it up the chimney and then proceeds to burn the coke, which is only shout one-half of the it at value of the cost, besides it is not alone the heat that escapes up the chimney, but the rich combustible gas that passes away uncon sumed. This gas when burned produces a uniformly



ARRANGEMENT FOR BURNING THE GASES OF THE

higher temperature than the coal liself, which may burk at varying temperatures even so low as to produes but little heat

The elinkers that form in the furnace are the result

of an excessive draft below the grate

To accomplish the mixing of the hot gases and air

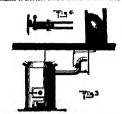
the air must be heated to the same tomperature.

The most common domestic heating furnace is the bot-air furnace. This is simply an improved stors in-closed in a sheet iron or brick casing. The furnace eats the air within this inclosure to a high ten

tin pipes. To keep this current of hot air rising, a tin pipes. To keep this current of hot air rising, a "cold-air box" connects the lower part of the turnace with the outside air and is regulated with a damper This cold-air box should always be kept open as much an possible and nerve entirely closed while there is fire in the furnace, as the furnace will become overof and may be injured.

neated and may be injured.

Fig 1 shows how the common hot-air furnace may be adapted to burn the gas of the coal A small pipe, any 1 inch or 1/g inch is inserted through the upper part of the smoke pipe (as the gases here are the hot-cet), torminating in close proximity to the smoke collar just inside of the radiator of the store. The inner end may be fitted with a suitable spreader, such as shown in detail in Fig 2. The cross pipes have a number of 3/16-inch holes drilled in the lower side, or



HAND METHOD OF PROSTACTION THE DAMPERS.

faring downward. The outer end of the pipe is fitted with some kind of a damper to regulate the supply of the come kind of a damper to regulate the supply to be comes bested and at its delivery end is of the same temperature as the passed, but as the specific gravity of this bested kir is much greater than that of the same compared to the same of the same compared to the same to the foresterned in the foresterned the compared to the same that of the same to the foresterned into the burn with a blood fine, but as in an ordinary gas about the same process of the cesting phonomer

in order to make the system a success the fire pot must be in perfect condition, that is to say, in a hot sir furnace there should be no communication between sir furnace there should be no communication between the fire pot and the air chamber, no crusk and no loose joints. The fire door should be as air-tight as possible. This may be made tight in the following manner. First, fits and remove all rout at the edge of the door until in notalitic surface appears, then are a narrow strip of assession and soak in sail water, after with placet is around the door and it will salers? Fur s litle oil on the door frame and close the door The nebestos will then fill up any opening and bake very hard on the door

if everything below the grate were absolutely air tight no combustion would take place, but as all furtight no compution would take place, but as an revenue last more or less this leakage is enough to support combustion in ordinary weather. In extremely cold weather, however, the silde in the sah pit door may be opened a little, so as to furnish a little more alr

A damper is attached to the smoke pipe above the air pipe, so that when open it will not cool off the air

A fire is built in the furnace the ordinary way, keen the air damper closed until a good fire is obtained than put on some coal and keep the lower damper open for a few minutes, after which close all drafts and open the air damper, regulate the same according to the heat required, that is to say, more heat, more to the heat required, that is to say, more heat, more air "Through the before-mentioned mics window ob-serve the results. All the gases in the furnace will, however, not hurn, as some are bound to escape up

consumed

There is more economy in running a large, slifter all day long than a hot one at intervals. The fore it is best to cosi the first twice a day, in the moting and at night, and regulate it so that the fire bur with an oven temperature. It will keep the house at

with an oven temperature. It will keep the house at a uniform temperature night and day.
When the furusce has been cooled for the day or the night the dampers may be controlled from any room above by simply relating or lowering a lever com-ned with winner ranking over pulloys to the various dampers, thereby savings many a step. This is above in Fig. 2, a sectional plan of the levers is above in in Fig. 2, a sectional plan of the levers is above in

Fig 4 in ordinary weather the fire should only be shaken once a day, preferably in the meresing, but in very mild weather twice a week will suffice. Only shake until the first red coal comme down. In furnaces with very strong drafts shake but very little, as the layer of ashee on top of the grate will help check the draft. If the fire is very low stick a few phones of kindling

wood into the fire. This will heat up the submissiple. The sub-pit door may also be opened until the file is drawn up, then regulate as before described. With this arrangement in good working order over

particle of coal will burn to an ash. oal, of course, will not burn.

This applies to all three heating syst

use, namely, hot air, hot water, and steam, as it only takes care of the fire.

takes care of the firs.

In botair heating, in addition to regulating the fir
the cold-air hox must be regulated. This box genera
ly terminates outside the building under a porch,
has always been a source of annoyance because
changes in the direction of the wind. Sometimes ti changes in the direction of the wind. Sometimes the wind will hole directly into it and cool off the house, hut when the wind is in another direction it will made the hot air out form the furnace into its atmosphere. To overcome this a shield is placed in front of the box, gay 8 tendes from the hulding, overlapping and 12 to 18 tuckes all around. Then it will be impossible for the wind to interfere with the regulation of the air, which is generally done in the ceillar with a damper or shutter

or shutter

The pipes in the cellar leading to the registers about be kept clean, also the registers Areld public ting any wire useful so catch articles dropped thereon, as it will catch more dirt than anything also, sometimes clogging up to mension completely, forming an excellent breeding place for bacteris.

The water pan should be connected with the water supply, controlled by a fient valve. This incurse an over water level in the hurtaxe.

In steam beating plants the boiler and radiators In steam besting plants the boller and redistores should be large enough to keep the bause at a temperature of 70 day in zero weather with one possible of the part of 70 day in zero weather with one possible of the part of 70 days and the part of 70 days are done on the best better that redistors are done on the part of 70 days are done on the part of 70 days and poor the next, despite favorable winds, the fault is with the chimmey it should be built lighter This is a great

deal cheaper and better than to put an unsightly

HOME-WADE AND SIFTER. 27 F A 26

A dustless ash sifer can be made at a very small expenditure of money by following the lites of the accumpanty of swelly Make a bor A shaped as shown about 2 feet high 2 feet long, and 10 inches high at its lowest part. The box should be of such a width as to fit a square hole in a base board 2 Make the base board such as shown as the same of the same board of the same and out a square hole in the base board of a such as also set to be a such as the same of the same and the same an

narrower than the inside width of box and 1 inch shorter than the inside length of the box Bore a \(\frac{1}{2} \)- inch hole in the conter of one end of like frame and cover the frame with ½-inch mosh gairanised netting.

Inclose three sides of this frame with thiu board
about 0 inches high, tapering the two sides, as shown,



SECTIONAL VIEW OF THE HOME-MARK ARE SIFTED

and leaving the discharge and open, which should be hinged to front end of hox with two 2 by 3-inch hinges. Put a piece of rope through a hole in the upper end of

Part a piece of very through a hole in the upper and of frame and finishes it on top to be 1; will in an exten-frame and finishes it to top to be 1; will in the set at The hor is more ready for the top which has a hinger floor D, as shown. On top of how place a padiegr and run the rope through the hole in the top of the hear and over the pulley wheel. The one of with rope inter have a large riga attached to it as shown. This arrangement will allow the stifting frames to be swram up and down, harring the frames or were time it, strikes the hole. I framend to run of the hox. Over the opining in frame of hor famine, happenings and prevent dust free; frame, This stiffer has prevend very classes simil does not be quire a sessible showsting of pitted asiless.

REGENTLY PATRICED INVESTIGNS.

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Electrical Davices.

BEAEXING DEVICES.— W GILBA, New Bedford, and C W Tubar, Fairhaven, Mass. An object of this improvement is to provide a circuit breaker on an induction cult which will give one large park instead of a succession of sparks, such as those produced by the ordi mary forms of 'bivator'. Means are provided by which the core of the cull may be thor oughly magnetize before the herek occurs.

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11-5 LOADER.—J A JOHNSON, Wasco, iii
The mechanism extries the hay from the
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may discharge the contents of the bottle by merely pressing upon a knob. When the press-ure is relaxed the bottle is closed automatic ally

ally POST POEMING MOLD—W W RAILET, Chadwick, III Tale invention consists of a post forming device or mold which will permit of a post being formed in the mountain of a post being formed in the mountain of the post of the finished post.

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thereugh manner. It relates to a rotary press into made for lutricating holds the axis and that forces the material to pose through the wheels. It is the wheels the state of the state of

Norse—Copies of any of these patents will be furnished by Munn & to for ten contends Please state the base of the patents like of the invention, and date of this paper



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they are described in the appendixes to the review experience successive. B. Lattery Rewall. New York D. Charles Montry Rewall. New York D. Standard S. Lattery Rewall. New York D. 18mo., pp. 88. Price, \$1 The book is brinneded as a textbook for actions and collemes and is brinneded to harmheld the control of the collement of th

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INDEX OF INVENTIONS

Por which Letters Patent of the United States were issued for the Week Ending January 25, 1910,

AND BACK BEARING THAT DATE (See note at end of list about copies of these patents.)

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Its Manufacture and Uses

By JOHN K. BRACHVOGEL, M.F.

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P A MILLER

SPARK COILS

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Industrial Alcohol The Design and Construction of Induction Coils

A. FREDERICK COLL

will work gives in minute details full pr directions for making eight different a colls, wrying from a small one giving half-back sparts to a large one giving it aparts. The dissensions of each faul even to the smallest serve are given, and of these are written in accordance of the

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& BOT MELLER RATTERS STREET (Continued from page 188.)

A NEW HOMEAND RAFFERSY PRIMERY SALE.

(Considered Tyruk pengi Est.)

A problem seld blacted trucks. So far they

have Raided to develop any services afficial
tion, It tooft the utmost patience of the

bary to a state which he now considers

practically "not-proof" Naturally the

public has not been so patient and has

been granulining about the long delay in

jubile has not been so patient and has been granking about the long delay in developing the bettery concerning which or much has been promised. The other day the public was invited to import a street railway car equipped to import a street railway car equipped to a short section of the bettery has been delay to the ordinary car not only in the power source, but in soveral design free amount of current to be stored in the bettery in thirt of, and in order to make this power go as far as possible it was essential that importance weight be eliminated. The question of weight is not so vital a manurer received as great deal or a stantion. Mr Raiph A. Beach, who has been Mr Raiph A. Beach, who has been sufficient in adapting the storage battery to traction, was called upon to build a special car that would be as light as possible He found that the common street car is merchy a smaller and alightly as possible He found that the common street car is merely a smaller and slightly modified steam railroad car, and it was necessary for him to branch out on en-tirely new lines. He guarded as jealously against unnecessary weight as the builder of an aeroplane The backbone of the car he avoived consists of two 18-foot lattice girders which extand the entire length of the body under the ser's They consist of electrically welded steel bars and are so inflexible that when loaded with two so inflatible that when loaded with two tons at the center they show a deflection of but \$71000 of an inch Around these two girders the car is built in the first place they form a casing to receive the batteries of which there are 210 calls, 100-cm each side for power and 10 for light-las Aall the superstructure of the ear is built of wenter and light woodwork with the exception of the strap rails and posts, which are of bicycle tubing and act posts, which are or ocycic tubing and act as a framework to support the weight of the roof. The roof itself consists of a single sheet of veneer bent to the proper form, and is so light as to permit of making the side posts much smaller than in the ordinary car. The fact that this car does not have to authors a troller

car does not have to support a trolley pole has allowed of using so light a roof. pole has allowed of using so light a roof.

The truck contains many novel features. The connection between the truck and body is such as to permit of a side and end movement of but 1/4 of an inch, and end movement of hat M, of an insh, and an anthough it may more vertically to a much greater degree. The object of this is to insure smooth running and to prevent the usual swaying. In place of the usual car whese light steel whesis are used. The arise are divided at the center, being connected by long sheers which parmit one wheel to gain upon its must when rounding curves or it case of a slight difference in their diameter. In the arrangement will be seen the influence of the automobile. There are other features are well which remind one of the automobile and show a radical departure from the common car construo-

the automobile and show a radical de-parture from the common car construc-tion. In place of gearing the motors directly to the wheels a silent chaft drive in used which, as automobile practice has abown, furnishes a more economical transmission owing to the fact that a large part of the sprocket wheels is in mest with the chain, whereas in the apur with the chain, whereas in the spur gear transmission only one tooth, or at most, three teeth of the pinion, can heaging the teeth of the gear. Furthermore, the chain drive parmits of a greater gear reduc-tion. Commenty at to I reduction is the most used on railway cars, whereas on to 1 is employed. This permits of us

was adopted.
The our is equipped with two become power 110-rolt motors which are; of a very light construction. During the bound tasks the pix matriants of matrials.

(Constructions, dec. 2012)

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(Continued from page 132.)
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> ARTIFICIAL PRODUCTION OF THE VOICE. (Concluded from page 120) emitted by the larynx were recorded by a phonograph The following conclusion

were reached

When the larynx of a dog is remo during chloroform anaethesis, the lar during chloroform anaethesia, the lar yngcal muscles retain their ability to con tract for a short period, which varies from 3 to 10 minutes, but no contraction can be produced in the muscles of a dead even if it is removed immediately the arterial blood has escaped the arterial blood has escaped in order to produce the vibrations the current of air should be impailed by a pressure of from 6 to 8 inches of water as it is in the normal production of the hu In these conditions the excleed larynx of the dog barks and howis in every note of the canine register from the deep baying of a mastiff to the shrill plpe of a torrier. These various notes are obtained at will by causing various muscles to contract. If the stimulation is confined to the muscles which connect baying of a mastiff to the shrill a terrier These various notes the two aryteneld cartilages (two small cartilages at the back of the larynx to cartinges at the back of the laryax to which the posterior ends of the vocal cords are attached) these cartilages ap-proach esch other and a deep tone is produced if on the other hand, the stimulation is extended to the muscles which connect the arytenoid cartilages with the thyroid (artilage (the large shaped cartilage at the front of the lar which the anterior ends of the vocal turds are attached) the vocal cords are contracted and a high, shrlll note re

The pitch of the note appears to be in depend at of the pressure of the air and the strength of the electric current, and to be determined solely by the part of to be determined sololy by the part of the muscular system of the larynx to which the stimulation is applied. The whole larynx, including the gloitle and the epiglottis, changes its form with every change in pitch Hence the larynx is a musical instrument which produce various notes by changing its form and

These experiments, in addition to their urely scientific interest, explain the dden loss of voice to which singers and public speakers are often subject. The loss of voice has nothing to do with the vocal cords, but is caused by a sudden contraction of some of the muscles which control the glottis and is analogous the rheumatic and neuralgic cains which

DEDWARD DATIONS THE PARKUE PRENCH POTTER, AND HIS WORKS (Continued from page 125) sti, that inodern scientific re

search has proved to be correct. He was arrested as a horotic in 1588 and im ured in the Bastile, but in 1590, before

nured in the Bastlie, but in 1590, before he can be also midsposed of h, deid-Quite a number of authentic specimens of his work are in existence, and they are specifically as priceless in value as they are superbin execution. At the Lostro and Cluny Museums, from which our illustrations are obtained, (Concluded on page 136)

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and china balls, and as fixtures or ornaments on light- ning and equipment, also weather values for same bar-	Heating and surveing insertine December	is rapished in Selectific American Bupplement 1972.	W five the problem of the Keleite by the Community of the
Inquier No. 86 St Wanted from who make me.	Illuminated fountain P G Journ 947,241	THE BUILDING OF A STORAGE BATTERY	Sash, window, G. T. Palson. Rew hands, Rarton & Trump. 187 dill Rev b. P. Ward. 188 dill Rev B. W. Carr. 188 dill Rev
chinery used for purertaing some-stone	Indicator generator for ignition purposes, 11 J & T F Priderak 947-647 lukaland with self-filling well, H Kielt 947-656 insulator W T theidard 947.516	A SEWING-MACHINE MOTOR OF SHRPLE DESIGN is described in Scientific Assortion Supplement 1212. A WHICKTOTORE ERIDGE, Scientific Assort	Baw set, T F Ward
inquier No. 9668. Wanted to buy machinery to manufacture soul on a racks	insulator w T theidard 947,516	DESIGN is described in Scientific American Sup-	Scale, weighing, W. C. Carr
inquiry No. 9663, Wanted to buy a plant for manufacturing murialic acid.	Institute suspension nevice for, A 0 447,274 Internal combustion engine, F W Bridy 947 653 Iron new reducing 1 B Morgan 947 668	A WHEATSTONE BRIDGE, Scientific Ameri	definitive and showers. A. K. Chapin, 947,600 Recore board J. P. Kessatin Serveyer, road, T. & A. A. Addison Servey Base are opening normal. Recore stating and separating machine, J. M. Callow.
Inquier No. 9845 -Wanted to buy a second hand			
jelephone generator	Callaway B47 226 Ktocustographs, means for regulating the	tained in Selectific American Supplements 1834, 1868, and 1867, Full details are given so that the cole can readily be made by anyone	
export for making rice-finess and wheat-fines.	Hindination of films in, is throads 167,460 trible in the film of	the colis can readily be made by anyone	
inquier Vo. 8867 Wanted the address of makers of the Mandard Folding Typewriter	Lamp hanger W M Batter 947.550	HOW TO MAKE A THE APPROVE to described in Scientific Asserting Supplement 505.	Surder attachment, H. Brown
Inquier No. 8068 - Wanted to buy meeninger for	1 Manual access for incrementality to	A MODEL STRAM ESGISTS is thoroughly de- periture in Selectific American Supplement, 1887.	Sewage in sewage plants, vertilates and
washing machinery	Lantern reflector, detachable A N Morri-	NOW TO MAKE A TERMOSTAT is op-	scrattin of F Hamilton , 947.00 Sewing marking, T G Plant , 947.40 Sewing marking, or Plant , 1947.40
inentry to 9000 - For the address of from mak- ing cluste chile comething like ladies' parses are	Lantern reflector, detachable A N Morri- son Der, 500 Latch H Hoffman Der, 500 Latch for cut out boxes, T Q, Andreayh 947,468 Lens shaping machine Oermain & Owner 467,774	16th, and 1666.	head frame, C. A. Labelstone by the label late late late late late late late la
made of	Lattin received, detected A R More Life of Holland Control of the	ANTEROID NAROWETTERS, Scientific American 'plements 1900 and 1904.	
Inquiry Vo. 9070 -Wanted manufacturers of motal cartings for art immp shares	lie Fuy 947,877 1.150 hopy rack, il 8 Lone 947 446	A WATER BATH, Scientific American Depole-	State rolling and curising adjustable rep-
Inquiry No. 9671Wanted the address of par-	letter and attachment, composite E. M. lie For Libe booy rack, C. R. Lenn Lighting applaence F. A. Fridhamp Lighting arrester W. A. Bislon Lideric Seat, G. L. Mastehard 947,807	AVANTA ANTA TANK MANAGE	port and bracket for, T B. Johnson . 947.00 Shalor, combination, H. J Tirmer 947.53
pots.	ideald their vaporising apparatus, P J II	Annatar Superior 186	Shaping machines and the line, speed ben per like makes the makes also bellets
In quiry to. 2073. Wanted, machinery for mak- ing fine chains, such as used by jewelers, etc.	Lock, H B. Sendii Spricker , 947,488	Buch number of the Seleptife American Sup-	ment diving machines, device for, W
Inquiry to \$873 - Wanted, machinery to mana-	form for weaving tailed pile fabrice, E. alf Per	pleasure costs 10 costs by medi. Order from your neverteelester or from	Short metal articles, markins, for making, sell-int
Impairs No. 9874. "Wanted to buy old model lo- composition or elementation, such as were exhibited with mathelian the-elos standarded in feart human, etc.	I from for weaving tatted pile fabrica, H. Simpson I som shertle, P. H. Bealrei shricating inperiodism W L. Morein storicator, P. Chibiandon storica	MINO & CO., Inc., 345 Brendway, New York	March metals orthogo, marches, for making, and the control of the
organities or elementous, such as were exhibited with makel-in-the-slot attackments in farry house, etc.	shricating imprintation W L. Morein 947,600 shricator, P Chilimides 947,600 sunbor sheet, built up, G. A. Wright . 947,600		ALL DESCRIPTION OF THE PARTY OF
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Pro- main de SCHOTHE ANGREAN des prints à Marie

to Conclude from page 123.)

he is very completely represented by throught specimens showing the three distinct styles, that he adopted in the course of the descripment of his art. His first dishes were usually oval in form, decorated in the center and at art. His first dishes were usually o'us form, seconded in the center and at the other with a sure of the comment of the center with a sure of the center with the center of the center o h an illustration is here pres and he modeled in miniature sculpture and afterward colored and enameled a very diversified series of small articles. e, hardy-gurdy and bagpipe players

We produce berwith a portrait of Bor-ndrd Palisay from an oid Prench min-ature of his period on vellum, that is oreerved at the Cluny Museum Palisay is represented, full face and in court co-tume with ruffs. His doublet is embroid-ered and relieved with gold, the sleeves are be-ribboned, and on the chest is braid ve the head appears the inscription

Anove the need appears the inscription

His works roffect slike genius and
artistic taste, and his work was original,
marvelously true to nature in execution
and coloring, and probably in a more
marked degree than any other master of marked degree than any other masser or the ceramic art, he learned to perfect colors that would be, after firing known quantities, a knowledge that enabled him to duplicate, with such wonderful cer-tainty, the color offects of the fish, reptainty, the color effects of the fish, rep-tiles, insects, etc., he loved to reproduce The extent to which his style was imi-tated affords the most practical proof of the favor it enjoyed

Solders and IP you want a complete text book on Solders and the ext of Sedderlar, groung Position, and the ext of Sedderlar, groung Position, or Solderlar ground Position, and formula, which can be used by the metallurger, the goldentul the used by the metallurger, the goldentul the used by the metallurger, the goldentul the sund that worker and the metal worker and the metal worker and the metallurger and the sund that the sund the sund that the sund the sund that the sund that the sund that the sund that the sund Ap electro-pneumatic system is used in the Berlin royal library for carrying out the distribution of books to the readers. the distribution of books to the readers. Upon this system the reader fills out a blank containing the name of the desired book, and upon this blank an employee writes an exact indication of the place where such volume is to be found. The bulletin is then sent by pneumatic tube to the central office. This office is direct to the central office. This office is directly connected by elevators with the different atories of the building. These electrically on a push-outton system Beaden, there is a large elevator running through all the floors for transporting persons and books. A set of posentation types are not present and books. A set of posentation that different floors which contain the books. The employee of the central office of who receives the reader's building sets of the central office of the present and books. books. The employee of the central office who receives the reader's bulletin sends the same by posumatic tube to the proper flow, and on this floor; has storiloadist read flow, and on this floor; the storiloadist read that the service which takes them to the on rail office. The latter office then sends the books to the point from which the begintin was sent in the first place, either in the main reading room or any other of the rotten of the billoady.

Writing to Stahl and Eisen, a German Writing to Stahl and Hissen, a German manufacturer states that be has succeeded in making satisfactory high-speed steels with powdered terro-tongsten. The attest desiration 0.8% of transparence, 0.30 carfoon, 0.35 aluminium, calcients, and magnedum, and aluminium, calcients, and magnedum, and 0.01 of sniphur The powdered ferroentage with mote results then white allow mote tength then dily then tung

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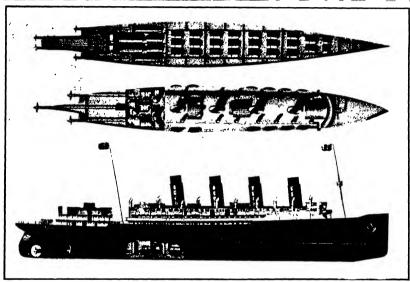


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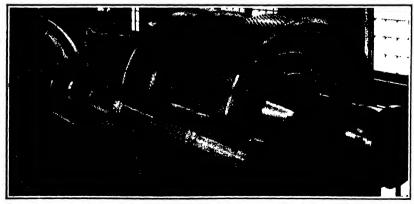
Vol. CII.-No. 7

NEW YORK, FEBRUARY 12, 1910

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The upper engraving shows the space occupied by the boilers and engines of the "Mauretania." The two lower engravings demonstrate the large saving in space resulting from the new of high-speed turbines, driving, through reduction gream, three slow-speed propellers. They would save 1,600 tunes from all and orre \$5.00 on each transmitalinit trip



The pinion, direct-connected to the tarbine, russ at 1,500 revolutions per minute. The spar wheel, direct-connected to the projectler, russ at 200 resolutions per minute.

2. **EXPLREDUCTION** ORAL—A WAY OUT OF THE MARKET TURNING DILBERTA —[See page 142.]

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NEW YORK SAFI RDAY FEBRUARY 12th, 1910

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CANADA AND THE QUEBEC BRIDGE.

NGINERING and are historium works of tifirst magnitude are to no little degree au
expression in contrete form of the character
of the people by whom they are built it
would be difficult to define the extent to whith our impressions of the smilent tirrek are based upon the mrchitecture of his unbie shrines and temples or how far uur respect for the later Roman is due to feats of engineering skill that would do credit to our twen unitaxilivi

Because of the skill and daring which are or seem to be involved the design and erection of bridges of summand magnitude has ever been considered une of the most difficult, we had almost said spectacular feats of construction and the successful creetion of such elevatures has brought world wide famo to the and distinct national credit to the in which the work was done. Thus the Forth ilridge in which the work was don. Thus the First littles stands to-day as one of the noblest mountenies of constructive engineering in the whole of the tittlish cupitre, and a memorial to the man who was responsible for the design has recently been placed in Westmin rter Abbey So too ou Bruoklyn Bridge over So too our own beautiful and diguified ridge over the East River is a lasting tribute to bridge engineering as initividualized in America and the city of Trenton has recently un-velled a monument to the memory of Roebling the

velicd a musument to the neumory of Robbling the lather of long span sups union bridges. But that selfsame notoriety which brings internal tomal faune to the man and the people who carry great engineering works to a successful issue must, in the very nature of things throw a proportionate shadow of discredit when one of these great struc-tures falls in utter ruin and, as in the case of the tures falls in utter ruin and, as in the case of the Queba Bridge carries migh upon one hundred souls to destruction. This fact was frankly recognized at the lime by the capture ring and to built all press both in this country and in Canada, and it was realized to be a matter of national importance that when the bridge came to be rebuilt, the new structure not only be perfectly stiff and strong but that it ild embody soch architectural frontment as wor render it esthetically pleasing to the eye, and worthy of that great school of bridge engineering which has sprung up and fluurished in the Western Hemisphore

When the Canadish government took hold of the matter and lent all its powerful prestige and financial sesistance to the scheme, it was accepted as an nugury that the new bridge would be wurthy of the great Dominion across the border line. We have to confus Dominion across the border line we have to contrast box ver that the bridge which it is now proposed to build its decidedly disappointing. The type selected and the method of treatment are not up to the latest standards of bridge engineering in other words the design is distinctly commonplace. Æsthetically it bas not a single redeeming feature

in redesigning the bridge, the Canadian government could have made more sure of securing the best pos-sible designs, if they had thrown the bridge open to some designs, it they had throw he arrays open to world-side romposition. We should then have learned whether the atrongest, most economical and most beautiful brilings tould have been secured under the cantillevir or inhier the suspension system of design. It requires the suspension system of design. ld be possible to produce a suspension bridge would be greatly superior to the structure which it is ros proposed to build. The suspension bridge espe-cially when built of those great proportions is a far-asic bridge to creek not being subjected to those heavy erection stresses which are the peril of large cantilever erection. Moreover, the ossential elements namely the amborages the towers and the main cables are at all times entirely free from suspicion, and may be erected with the absolute certainty that they are well within the limits of safe construction. With these main elements assured, it is possible for failures to occur in subordinate elements, such ag the suspenders and stiffening trusses, without in the least endangering the integrity of the bridge as a whold.

Not so, however, the cantilever bridge, the gree part of whose intricate framework is in compression. Let but one among the multitudinous members of the main trusses fail, and the whole structure will be thrown into immediate and absolute ruln the mass of tangled steel now lying in the St Law

rence River

For the recdit of the profession of bridge engineering in the New World, for the prestige of the great
and growing people of Canada, and above all for the
creater safety of the public at large, we trust that,
before the final plans of this great bridge are adopted the Canadian government will take steps to make it coriain that the final bridge will, from every point of view—ongineering, architectural, and artistic noblest work of its kind yet erected in any co

CAUSES OF THE PARIS FLOOD

HERE appears to be a consensus of opinion muong the French scknists that the causes of the recent phenomenal rise of the Belne when it reached the record height of 31 feet 2 inches, are to be found more in geological than in interorological conditions. The basin of the Seine and the streams that are tributary to that river consists of a light absorbent sell, and, as the slopes are gentle around In winter when the soil is either frozen or enturated by the rains, there is a risk that the run-off of a heavy precipitation will be so large and audden as to overtax the canacity of the river channels. These conditions obtained to a marked degree during the re-cent continuous heavy rainfall and flood. Member the reologist is of the opinion that the heavy rains pre-ceding the flood found the soil of the Seine watershed so thoroughly impermeable because of saturation that the unter ran off as swiftly as it would from the surfe the unter ran off as swiftly as it would from the surface of an asphalted or comented street. Furthermore, it seems to be generally agreed that the denudation of the forests in the higher regions of the watershed has been a contributory cause to the fixed Not only do the trees assist evaporation but the furest undergrowth also assist evaporation but the farest undergrowth also exerts a material influence in retarding the flow of

Referring again to the question of the prevention of future fixeds at Paris regarding which we made editorial comment last week, there is an alternative plan to that uf dredging or widening the channel and no that ut dreaging or which, were it not for the coormons expense involved would afford an absolute coornous expense involved would afror an absonute safegnard against future diseaser. We refer to the herole measures employed by the Austrian ongineer to prevent the fooding of the city of Vienna by the river Danube. This consisted in cutting an artificial this consider in countries are the city through which, after the river reaches a certain elevation all the surplus waters are diverted and discharged into the river waters are diverted and disagreed into the river-below the (if) It would be possible to create a sim-ilar by man around the (ity of Paris, but the cost due to the great value of the land which would have to be condemned would probably be found to be probiblitie

WATER CONSUDERATION IN MEW YORK STATE

FFER about three years of investigation of the subject of water resources, the State Water Supply Commission estimates that 1 500,000 horse power of water energy is run ning to waste every year in the State of New York and that if this were developed according to plans drawn up by its ongineers the State would realise a vestly rental of at least \$15,000,000

a result of its investigation of the watersheds of the Hudson, Genesee, and Raquette rivers the Comtion has located and surveyed four reservoir pr jects for the development of water power and the control of floods. These are the Sacandaga and Schroon Lake reservoirs on the Hudson, the Portage received on the Genesee, and the Tupper Lake reservoir on the Genesee, and the Tupper Lake reservoir on the Requeste The Commission considers that the Hudson River, bocause of its size and the large population and important industries of the cities attended along its banks, should receive the first consideration. nated along its banks, should receive the next emission cration in any system of conservation that may be adopted, and it recommends the construction at a voint on the Sacandaga River, 50 miles north of Albany of a dam and storage reservoir of 25 billion is feet enpacity. Such a dam would convert 20 es of the present river valley into an artificial lake

miles of the present river valley into an artificial labe of the since of Lake George The principal object of this reservoir would be noted back and since the flood waters, and afford re-iled during the low-water conditions of the summer to the various power plants about the Hudson. by releasing sufficient water to maintain the level of the river at the desired stage for operation of the Parisualle plants. In addition to the great benefits abrorded by much control of the stage of the river

water, the power developed diffectly in connection with the big dam would be transmitted electrically to such towar as a library. Trot, Mechanicaritis, Ginan Palis, Utilez, Schenectary, and other less important com-munities typing within the sone of economical electrical transmission. It is estimated that the reservoir would transmission. It is saturated that the reservoir would cost \$4,650,800, that the total yearly fixed charges and maintenance would amount to \$227,700, and the annual gross earnings \$427,600, leaving an estimated annual net revenue to the State of \$189,800. The commission estimates that on this basis the cost of the reservoir would be refunded to the State in fifty years at the end of which time it would be the sole owner of the works, which would yield a perpetual income from the saie of the stored up water

income from the sale of the stored up water.

The Commission advises that the work be undertaken by the State, because under State control the necessary funds can be provided more economically, and the interests of the public can be absolutely safeand the interests of the public can be absolutely sare-guarded it recommends the enactment of a law au-thorising the development of the power of the Hud-son River, the construction of a storage dam on the Bacandagn at Conkingyille, the amendment of the Constitution to permit the flooding of State lands constitution to permit the flooding of State lands in building storage reservoirs to be owned by the State, another amendment providing for a bond laste to meet the expense of building reservoirs, and the huilding of other reservoirs to requisite the flow of rivers for power purposes and flood control

STEEL BELTS.

N Germany steel belts are used in many large N Germany steel belts are used its many large factories and electric power stations. The principal difficulty connected with their employment is that of joining the ends of the belt. Three-ends are now provided by the makers with steel plates which need simply to be served together. It is necessary to use alread of special quality and temper it is not another than the steel of the provided by the material content of the server can define the server content of the server can be served by the server can be served by the server can be served by the server can be served to the server can be served by the server can be server can vas, to which thin silves of cork are attached in order to prevent slipping. The cork lasts practically forever and reduces the sliding to less than one tenth per cent and requires the sitting to less than one tentil per con-or the travel Prof. Kammerer has experimented with a sleet strap, two-fifths inch wido and one-fittleth inch lick, with two wheels, either feet in diameter for the transmission of 16 horse-power with a tension of 400 pounds. Although the wheels were not covered, they worked very silentity even at a speed of 200 feet per second. The maximum slipping was one per cent of the travel and the loss of energy due to this cause was inapproclable

Steel belts possess the following advantages Steel beits possess the following advantages: The energy is transmitted without slipping and almost althout loss, the beits do not stretch their width may be reduced to between one-third and one tenth of that of leather beits transmitting the same power, that or teather bette transmitting the same power, consequently the wheels may be uncrower and lighter and the workshop less darkened by them. The steel betts do not deteriorate appreciably they may be used in damin places and du not appear to be attacked by amoke or acid. They sllow the attninment of velocianoke or acid. They sllow the attnimment of veloci-ties of 100 feet per sevend and are counsequently very autable for use with turnines. The required tension is one-tenth less than that of leather beits transmitting the same power, because of the difference in weight the same power, because or the directors in weight from whith results an additional economy, owing to the diminished friction on the bearings. Math room can be saved by using steel belie because their effi-tion; does not depend upon their length. They can be used horizontally in place of gearing. The makers sesert that they cost less than isather belts of good cuality

quality
The oldest steel belts have been in service two years.
In a Berlin factory a leather belt 24 inches wide was
uplaced by a steel belt 4 inches wide which transnits about 250 horse-power. The belt, after two years
use, shows an indication of wear. The only objection
to steel belts is that they are not easily seen, and consequently may cause scelefent 31 they are not caresequently may cause scelefent 31 they are not care-

A remarkable phanomenon was observed during a thunder shower in Finland in the animum of 1908 by V. J Laine, who was making meteorological observathunder shower in Fininada in the annurer of 1998 by . J. Lains, who was making metocological observations for the Finnish scientific society. The shower approached from the east and the thunder, which had approached from the east and the thunder, which had some and the same an

Scientific Američan

THOMETHING.

According to a recigit dispatch, a contract, for the construction, at a cost of \$400,000, of a dam; which will form part of an irrigation scheme in the seathern section of the island of Porto Rico, has been swelless to naive engineers, who secured the award in gompation with four american firms. The total cost of the scheme is \$25,000,000.

The heaviest rainfall ever recorded for a single day on the linkinus of Panama occurred during the great Scood of least Documber, between the heurs of 10 A. M Documber 38th and 10 A. M Documber 39th, want hair gage at Porto Bello showed a fall of 10.88t inches. The total fall for the month was 58 17 inches, which is equal to an average rate of nearly two inches a day

The steen frame, radder, and brackets for the new White Star lines "Olympic," which were recently suppiled by the Darlington Forge Company, are the beaviest errer cast for a steenably. Their total weight is 339 tons, made up as follows Stern frame, 70 tons, after boss arms, 74 tons, forward boss arms, 64 tons, and radder, 100 tons The total weight of the same parts as cast for the "SatureStant" was 130 tons.

The rapid elimination of the saling vessel is shown by statistic result; given by a German paper in the twenty years between 1888 and 1986 the percentage of saling vessels has declined in the merchant marine of Great Britain from 441 to 114, of Germany, from 84, to 131, of the United States, from early, the contract of the contract

According to the French paper Matin, the Minister of Martins is saking of the construction of two dread-nongists of 33,000 tons such in a programma which has complete of 33,000 tons such in a programma which has examined the arminister of the same consistency of the sam

The hoomester recently built for the electric operation of trains through the Cascade tunnel of the GRAT Hortzern Railway, where the electrical continues are tends for about six miles, welfas about 120 tends are tends for about six miles, welfas about 120 tends are tends for about six miles, welfas about 120 tends are working on a 500-voil; affected circuit. The pressure on the line is 4,000 voils, which is reduced by trainformare carried on the boomoutive. The power part, which is driven by water power, has sufficient capacity for the operation of sixty miles of the line

The Public Service Commission has recently adopted an order requiring the New York Subray operating company to install on all subvay cars destinating company to install on all subvay cars destination signs, similar to those now used on none of the are of such train. The company must also post in all stations, near the citect office, a map aboving the locations, of its routes and the streets intersecting the subvay likes; and all stations must be equipped with illuminated signs, placed on the subvay valle, for the former of the subvay valle, for the former of the subvay valle, for the former of the subvay valle, for the subvay valle, for the subvay valle, for the subvay valle proposed where the subvay valle for the subvay valle proposed where the subvay valle for the subvay valle proposed where the subvay valle for the subvay valle proposed where the subvay valle for the subvay v

B is olesmed that the lighthouse establishment of the United States government is the most compared and efficient in the world On June 50th, 1999, the service included no test than 1,651 lighthouse service included no test than 1,651 lighthouse perers; and during the dread year of 1910, 81 additional lighths, requiring the services of 47 keepers, with the stabilishment of three additional lighthouse district, convering Alaska, Forto Rec and the marst station at Canastamano, and the Hawalian Islands. The cost of the establishment list year was \$5,57,000.

the establishment last year was \$5,557,000. Ba a roosed communication to a New York paper, Mr Hodson Maxim shows the futility of stampting to work any serious destruction by the dropping of dynamite from a flying machine. He states that the destruction effected would be very much less than anyons not acquainted with the action of high explosives would suppose; and that many tons of dynamic might be explosed in the middle of Midsion Square without only more serious damages than the showing out of the windows of adjacent bettings by the runh of air windows of adjacent bettings by the runh of air forward the explacion to full the void formed by the

wents suppose; and that many tons of dynamic might be exploded in the middle of Mallacen Square without any more serious damages than the showing out of the windows of sudgested belieflings by the runh of air toward the explosion to fill the wold formed by the property of the suppose to the suppose of the

ELECTRICITY.

Less than a year ago the New York Public Bervice Commission of the Second District Issued an order limiting the number of passengers that could be carried on each car of the Pine Rills line in Albany Therê was so much public dissatisfaction with this restriction that the order has recently been withdrawn.

Are report on the the and yels commytten in 1906 at report on the the and yels commytten in 1906 total number of ties purchased by electric railways for the year was (455,586, of which 458,1196 were here and the rest sawed. A large majority of the ties were onch, the number being 2,614,600, chastant comes second with 1,488,138, while Southern pine and codar follow with 144,600 and 800,687 respectively. The unmber of poles benught by electric railways and electric light and power companies was 231,647, which is considerably jority of the poles were redar, viz., 285,689, chestant comes second with 186,050

In piece of the ordinary windmill type of tower whitharto used for transmission lines, a new form of tower is now beginning to find favor. It consists of two columns aspect a short distance apart and con nected by horizontal members. The plane of the lower is transverse to the direction of the line, and at its upper out it supports a cross arm on which the transmission lines are supported. The advantage of the mission lines are supported The advantage of the construction over the rigid windmill type is the fact that in case of a break in the line each lower would give somewhat and distribute the strain, thus prevent ing the towers from being pulled over one after the

The Illacds traction system covers a territory is unlies wife and 155 miles long. But he new work is being done along the lines of this system which requires the general measure to make frequent trips from place to place. To prevent less of time he has da a elooper and office car hull, it which he can conduct heatness while are route and which he can conduct heatness while are route and which will carry him over night from one point to another. The manager's car is well equipped with all the convonience that he might feature on his trip. It is provided in the forward part with an office room so arranged that it can be convexed his a beforeon with four berths separately curtained off. In addition to this there is a dising room and kitchen. The over-sell length of the

In the recent report of the Royal Commission or Cansis and Inside Navigation of the Bullet Kintolou, the following conclusions are reached on the question of electric bullety on cansis, analy; that a greater regularity and antiformity of speed may be unintained, that there will be fase received of the canal basks from waves, that there will be an economy in the size of the locks because the storage capacity of barges is not laken up with propolling machinery as in tups and steamboats, and that the electric power can be utilised from the control of the control of the conlong tags of providing for horse and electric hautage aloby a risk, but this proved to be in-specialbacuse the electric traction was constantly retarded by the slower bross-frawe boats.

One of the axibitie at the recent Unicage Electrical Blow, which attracted considerable attention, was the government seroplane fitted with a wireless tolegraph receiving and sending system. The chief difficulty in fitting up an seroplane for wireless tolegraphy lice in the fact that it is strung with wires used for bracing the parts and these interfere with the reveption of the message on the short autenna wallable on such a machine. The difficulty was overcome by stringing throw streams of No. It copper wis solony the under surface streams of No. It copper wis solony the under surface attacks of No. It copper wis solony the under surface at 100 pc with the surface of the

A serial proposition was presented before the recent meeting of the American Institute of Silectric Binghineers by Frof. W 8 Franklin and Mr 8 8. Septent. They propose to reduce the length of single-poseseries motors, so that motors of higher horse-power can be accommodated in the space between the drivers of a loomnotive. The reduction of length is edected by using a stationary senterior amenture and a revolving field and removing the consultator on an arrowants point. The communitator would be stationary and the brushes would have to be revited about they connection with the field This would provide type of motor should be stronger than the field, and would smalls a better utilization of the space ordmarrily occupied by the communitator The advantages of shaving the communitator accessible and constants; of having the communitator accessible and constants; of having the communitator successible and constants; of having the communitator successible and constants; of

SCIENCE.

Count Flunkett, the Director of the National Museum of Science and Art, Dubliu (Ireland), has received notice of a bequest of £5,000 to that institution, left by Mr Patrick Murphy of Newry

A new of eleven, map makers of the Geological Resvy, under the Leadwish of Chief Topographs r C H. Birdery, are mapping the Hawalian Islands Their work will occupy all told about eight on months, by the end of which time it is indepth that they will have succeeded in making detailed maps of Kaual, Caba, Moldokal, Mauri, and Hawali. This work is problemtly than the control of the control of the control of the Para all of the control o

Are the senses ever vications. The question is disused in Nature by 1976 Modericks and by several billed men. According to one correspondent the popuies notion that when a person lesse his sight ho is compensated by the gift of shillify in one. If not all, of his other resulting, is absured. He points out that the imputation of striking shillify does not enable a specialty intended billed man for earth his twill those by the exercise of that shillify. The billing are credited with powers in small, basket making and the little birt what they assert their right to live the ordinary lives of citizens they are not perbillited to do so

With the ordinary moving pit ture machine photorapius 2 is by 19 continuers are taken at about the rate of 16 per second, which is much too slow for taking a picture of a builtet or other projectile in flight Even if the rates were 60 per second so statisfactors; results could be obtained. In a revent number of the Zeltschrift; Instruum.nicnk, C Cranz describes a bailies in the continuers of the continuers of the continuers of all of 1/5000 of a second so that shot photographs of the shot can be found. The perdulum such makes shortled; cannot tions at sifferent points of its swing shortled; cannot tions at sifferent points of its swing and these are utilized to obtain the photographs.

The last opposition of Mars, although easerly welcomed by observatories of the world into by no means settled the port mails profit in districts surface each settled the port mail profit in districts are settled. For Port Ritchey has not succeeded in photographing them, and Antoniad rilli doubte the taticutes the canals It would seem that the time has come for each of the settled of the settled of the settled condingly Mr R G Allkin in a revent number of St accordingly Mr R G Allkin in a revent number of St cone suggests that Mr Lowell should limit to two or three shind nut for industry detail such as 12 b Hz area, W. H Helvering and B. M Antoniad to come to Flacetant to John him in observing vises at its next result were all Placetars.

Commander Parry has placed before the Board of Managers of the National Governphile Society as proposition in behalf of the Pearry Arctic Cub, to the effect that the Goographik Society join as this Debray of the Cub in an Antarctic expedition tha Arctic Cub to faraids as its share of equipment the sleamer "Roosevelt," used by Commander Parry on his North Pole trips and the Goographik Society join from the Indian for the other expenses to the amount of \$50000 the Decraphic Society and the Pearry Arctic Cub Commander Pearry delines to had the expedition himself, believing that the order should be intrasted to promper the Cub Commander Pearry and the Society and the Commander Pearry and the Society and the Pearry Arctic Cub Commander Pearry and the Society and the Description Land Commander Pearry and the Society and the Description Commander Pearry and the Society and the Description Commander Pearry and the Society of the S

Prof. Frank H. Enowiton of the U S Geo Survey, has just published in the Smithsonian Miscel laneous Collections a short paper entitled. Descriptions of Fossii Plants from the Mesozoic and Cenezoic The paper includes descriptions of North America." of two new fossil chain-ferns, the first of which called Woodwardia maroni, was found in the Fort linion formation near Rock Springs, Wyuming It is of special inforest from the fact that it is very closely re-lated to the common chain form so widely distributed over eastern North America from Nova Scotis to On tarlo and Michigan, and south to Fiorida Louisiana, and Arkansas. The other new species which he names Woodwardia columbians is from the Pleistocene and was found at the Cascades of the Columbia River In Oregon It, likewise, resembles closely a living spe-cies originally described from Mexico, but also found in Guatemala Arisona, California, and Washington Prof Knowiton also describes a Dennstaedita ameri come, which is characteristic of the Fort Uniou forms thus, never having been found outside of it. This fern has its closest affinity with a living species found wide-ly spread over China. Japan, tropleal Asia, Polynesia and Madagascar These three new ferms were found in excellent condition, showing the fructification, and are of special interest on account of their close resemblance to forms now living a very unusual experience with fossii nlanta

NOVEL AMERICAN MONOPLANE

The monopiane illustrated herewith The monoplane illustrated herewith to one of the most novel aerol lanes which has thus far been produced. It is the invention of Mr. A. L. Pätrner who for some time past has been as sociated with Mr. Grean H. Curtiss in the eroduction of his servicianes

This new monoplane while resemb ling the Curties by land in some the usual tyre is a distinct depicture from the usual tyre of shigh surface machine such as produced abroad by Bicciot and the Antoin tie Company Unilke the machines there is no square r triangular body extending the length of the muchine and carrying a iength of the machine and carrying a jair of wings near its front end in lace of this there is a single plane mounted upon four vertical wood strots at its center and having a fixed horizonial hall 10 feet at the rear and a single surface horizontal rudder 14 the ed in front just above and at the entr of the horizontal rudder Both judders are therefore always within the view of the aviator. They are ontrolled by a single whell laced scritcally in frost of the aviator. This which sign or crates sliding panels on the under side of the monoplane at each end for the purpose of mate taining the transverse stability. The ated by a single wheel makes this ma thine the simplest to drive of any

thus far produced

The plane has a spread of 30 feet and a fore and all width of 6 feet The plane levelf is but 31 fe t z 6 feet quivalent to an area of 180 square
for the silding wing tips are can
by fort by for from front to rear
The holizontal rudder is 6 x 3 fort in not not broaten rudder 1 feet in size and the vertical rudder 1 feet long by 2 feet high The dimensions of the tail surface are 6 x 2 feet 1 he total w ight of the machine the lanks being filled with 6 gallons of gasoline and 1 gallon of oil and the radiator



Cot wright let to H M B . or

Rear vlew of m plane, showing novel sliding wing tips

This is we should tail at it rear and the torur stairs liter with vertical red by above it is from to the single piece.



We Pfitzner at the control wheel of his monoplane I his vi wish we the all ale central wheel the newer plant and the ribs and trusting of the plant THE FIRST AMERICAN MONOPLANE TO PLY

pounds The weight carried per square fost is therefore slightly more than 3 pounds

nan 3 pounds

The four vertical goals forming the
hassis terminate in forks of seamless
teel tubing each of which carries a Minch uncomptingled wheel posts are spaced apart by steel tubing braces and by wooden skids extending braces and by wooden skids extending from the front to the rear The frest edge of the main plane is mounted upon these uprights 46 inches above the ground The rear edge which is formed of steel cables stretched over the ribs is 10½ inches lower than the front edge where it generate the reals front edge where it crosses the main vertical uprights. The ribs have a slight curvature of about 1 in 19 the alight curvature of about 1 in 19 the cambes being 35 in bee in the length of 8 fost. The center of pressure is closed about 15 inches back of the front idea of the place. The rhe are said upon two main spars running the entire inegate of the machine the for-mout of which forms the front edge of the place while the rear one is 10 of the place while the rear one is 10 of the place while the rear one is 10 and reals in about 100 lockets at ashed to the heavy main rise that connect the central vertical nordate. connect the central vertical prights
At suitable distances from the center of the machine on these front and rear spars vertical struts are stached war spars vertical strute are stateched to them for the purpose of trussing the plane. The 5th borns power 4-yri loude 4-yrice (vertice water-coled motor is mounted upon two laminated his rest rhough the monoplane sur face to the front day. The rear of the motor is substantially braced by four diagonal tubes as can be soon in one of the photographs. The propeller empedalty designed by Mr. Politary and Fost in allameter and Pfitter: is 6 feet in diameter and gives 235 pounds thrust at 1200 R. P. M or 94 pounds to the horse power The oil tank is seen just below the surface of the plane in the photo-graph just referred to The oil is cir-(Continued on page 150)

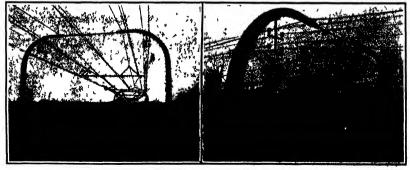
NEW OVERHEAD ELECTRICAL CONSTRUCTION ON THE N. H. R.R.

1h6 New York
New Haven &
Hartford Raii
road (ompany le
no weil satisfied
with the operation of its elec'-i-al sone from trical some from Stamford to Non



Diagram showing details of new overhead con

decided to extend the electrification for another forts miles to New Haven The com pany is also (Continued on



ficuoral view at Glendale showing the light and pleasing appearance of the construction.

Near view of a pair of curved supporting columns, showing a transmission pile hanger, suspended from the two 1%-inch main carrying cables

SMOKELESS POWDER-METHOD OF MANUFACTURE.-- II.

BY ROBERT G SKERRETT

In the issue of the SCHTTLITC AMERICAN OF February Etch it was shown how greatly the Improvements in the power of navil guas are due to the introduction and development of smokeless powder. The present articles is develote to the description of its manufacture. The base of our smokeless powder is cellulous—that womerful shad yet indescribable form of matter. Cot to its one type of pure cellulous—that in the Present of the control of the

In 1833 Bracomot discovered that starch dissolved in nitric acid and when cleaned in water became an intense explosive. A little later Pelouse obtained the same results by sosking cotton fabrics in that acid



The nitrating house is like a great, gloomy steam laundry the cotton being digested in centrifugal wringers like those in which (lothes are washed

and then washing them in water This was the first step in the evolution of sunchained powder. Because of the great violate and serrate behavior of the explosive than discovered it took years to develop it into a sile propellant. More than fail a country ago at a sele propellant. More than fail a country ago at a serie of the property curbon of the country of the property curbon and as series of as tidents and unex pecied explosions caused its abandonment Years later when the speedy topped box and the rapid for grant arrived. For each chumbin through stress of need found ways to check the explosive violence of gun found ways to check the explosive violence of gun

cotton and to fashion it into a safe and practical propellant. We followed France but our powder has been the immediate offspring of that produced by the great Russian chemist Mendeleff

reservations common sentences. The continues of the same and these videous corrections that common groupswise had been videous corrections that common groupswise had been videous and more neutry. The secret discovered by the chemists proved nitrocellulous to be some his to the influences of deterprets agents with a suddenness of explosion while the form of the mainter precision in a remarkable way the rapidity with which the granules here and gravaria the previous continues and proposed by the previous continues of the previous continues and gravaria the previous continues and proposed to the previous continues and gravaria the previous continues and proposed to the previous continues and previous the continues and the mustal velocity of the shot forms that the conditions imposed by each cellber of gau cast be met and halps grave late to the previous continues and the mustal velocity of the shot regulated with autoniability previous continues the previous continues and the state of the ordenness and the mustal velocity of the shot forms that the conditions are the state of the previous continues and the previous continues and the state of the previous continues and the same continues and the previous continues and the

Now for the manner in which harmless cotton is transformed into a ballistic agent at the Naval Pow deer Pactory Indian Head Md No official service are betrayed because the value of the process lies in the other proportionists of the various ingredients combined with particular forms of grains. These niceless are the outcome of lessons learned after much expermenting in which the variation of a tiny fraction of as inch may either make or may the nordest

menting in which the variation of a tiny fraction of as high gradient of a since any elicity make or mar the product. Oction when steeped in nitric acid becomes soluble in a mixture of other and alcohol if the preventage of nitration be less than 1276 and is insoluble when the measure of acid is above this arbitrary dividing line. When below this percentage on intract cotton which by nitration becomes an applicative—may be disabled by nitration becomes an applicative—may be disabled to the state of the second of th

dividing line of those substances soluble in other sleekei

The cetton used may be either the blooms straight from the fields or the while null issues In either asset the otton is cleanased by an situatine bath and then wall dided in an atmosphere of .12 d $_{\rm F}$ F The workmen toll in this temperature but the $_{\rm F}$ rich either the dided in the straight and why they are not boiled alive. The object of the dright $_{\rm F}$ to make the cition more, absorptive in the a 16 thus insuring more nearly per fact ultraidno. After the exist on has h a dried it is



The powder is forced through macaroni dies in the form of an endless rope, perforated from and to end with a concentric group of

packed in air tight consisters and sent to the attracting between where it is seased for half an hour in a strong mixture of sulficust and mirri a der The reaction frees from the cotton as a resistant of molecure which it not withdrawn could dilute the nitri a led and after the character of the produce with the country of all the characters of the produce of the country of hose a group attraction of the country of the molecure. They is vising the nitth acid unitugated and subble of doing its failt was upon the cotton

The nitrating house is n t unlike a big steam laun (C nine i en pag 11)



This view shows the important process washing the cotton in the alkaline bath for the purpose of re-



The ' pyre?' is piled into open tube, and transport to etenming tanks, where it is betted and belied to extract the major part of the clinging setd.



Ennaing the finic pulp through the "wet-machine," whence it comes from the reliefs in finked containing about 40 per cent



the of the resolution of hydrollers in which the "pyres" is unless with the otherwise had solventy and environment take "our petit," before pressing it take solid



the dehydrating house, where all but a very small percentage of the motheties is extracted by pressure and finally by the use of alcohol to drive the dampiness before it and leaves enough of the spiritis behind to form the needful solvent.



In the drying house, where the powder grains are stored away and dried to the proper sings, before testing and scaling away in alreations tanks.

NOT SESSEED FOUNDED IN MARTINGTURES.

A WAY OUT OF THE MARINE TURBINE DILLEMMA.

Provided that it can be run at the high speed as which is faul deficiency can be assured, the steam tur hine is the most evenoulcal of all steam on the most evenoulcal of all steam on the most evenoulcal of all steam on the high speed of rolation can be employed, since a type of generator may be coupled on that is austhalia to that speed. When the steam turbine is employed to drive the propellers of a steamability, it is no longer possible to run it at the best speed for economy, and this for hersams that the propellers at the outward end of the turbine shall shows it is own best efficiency at speeds of rotation for lower than those demanded by the turbine. If we run the shall at the maximum-efficiency at the propeller is the run the shall at the maximum-efficiency after of the propeller. If we run the shall at the maximum-efficiency appeal of the propeller, there will be low efficiency in the turbine.

Here as have a diffemma which the marine engineer has hitherto found it impossible to avoid Rt be astempted to cut the Gordian knot by a compromise, and has tried to find a mean speed of rotation (too siew for the tribine, too fast for the propeller) which would give the best or rather the least bad results on the 'rook per hours' basis.

the "could be solved by a continued by a period by a collection of the problem. He has been seen to be precised that the relution of the problem line in the selection of one see such that problem, and see far back as 1904, in a report to Green Westinghouse, George W. Meltille, the termer Euriner in Chief of the Navy, and Mr. Lohn II Marchigher, made the following statement: If one cruid device a means of reconciling, in a practical manner, the necessary light paped or revolution required by an efficient propeller, the problem would be solved, and the turbine with the comparatively low rate of revolution required by an efficient propeller, the proposition of ships. The solution of this turbine with the comparatively low rate of revolution required part of the proposition of the proposition of the proposition of the proposition of the problem would be solved, and the turbine week proposition of ships. The solution of this problem would be a sixthe of great against

10 the Intervaling years three entirely different methods have been desired for meeting the difficulty One is to install high-speed turbo-speciation, and utilize the current to drive alow speed motors direct-connected to the propoler shaft and experimental work in this direct hos has given such good results that the Fore River Bhighshilding Company re-ently put in a bill for the equipment of eur 2000-ten battleships with an installation of his character; in another synthem of the company of the c

It was no easy task to devise a gearing which would us monoibly and withest excessive wear at the high speeds required for steam turbines, and at the same time transmit the thousands of horse-power per devised by projeller shafts, which amounts in the case of the Wauvetanis' to about 18,000 horse-power per shaft. The experimental gear which is lituatized on the form large of the issue was constructed at the West-front jace of this issue was constructed at the West-front jace of the issue was constructed at the West-front jace of the issue was constructed at the West-front jace of the issue was constructed at the West-front jace of the issue was constructed at the West-front jace of the issue was the form the property of the interest of the interest of the construction of the property of

As will be seen from the illustrations, the garan are holical that is to say, they do not run straight across the face of the wheel parallel to the axis, as in the case of ordinary apur gears, but they are cut in the form of a stee pipiral. This constraint allows the wheels in roll into contact without shock or jar. Of course, this helital form of tools cause a strong sed through the properties of the sakes, and in throat in the direction of the axis of the shake, and in order to prevent this, me-half of the gase was cut the prevent that the opposite direction and the other way the end throat. One to dilutily of the teeth, is commissive halanced.

In spite of the marvelous accuracy with which the teach of gears can be cut by modern machinery, it is impossible to form them so truly and align the shate so perfectly as I get an absolutely uniform contact throughout the entire length of the gear. This is an important consideration in all gears, but becomes doubly so when, as in this case, they may have to transmit from tan to twenty thousand horse-power The inventors have met the difficulty by a very in-

The inventors have met the difficulty by a very significan construction designated as a feeting frame, which they describe as follows: "The frame which carries the bearings for the piston is a heavy steel casting supported only at a single point midway because the state of the piston, and the frame is free to escillate in a vertical place passing through the sait of the piston, but is held security against motion in any other direction. Purchasenes, Any tendancy of the test he bear harder at one and of the gar tann the other would tend to nublakenes the state of the sait of the piston cannot present any resistance to unbilanced on thirty, it constantly adjusts itself in the direction of its axis to escent any resistance to unbilanced on threst, it constantly adjusts itself in the direction of its axis to expective process. This means that the tooth contact researces are always automatically equalized. "If there are any minute irregularities in the opening of the teeth, which would tend to make the contact of the teeth which would tend to make the contact of the teeth which would tend to make the contact of the teeth which would tend to make the contact of the teeth, which would tend to make the contact of the teeth, which would tend to make the contact of the teeth, which would tend to make the contact of the teeth, which would tend to the tendent of the tendent o

"If there are any minute irregularities in the spacing of the both, which would lead to make the contact harder at one point than another in any part of the revolution this tendency is defeated by the footing regularity of the control of the control of the control of fair turn is controlled solely by the pressures of the seath of the pittion against the tent of the large gear Naturalty, the footing frame always yields under the sulphest tendency of an unbalanced contact pressure, in such a way as to transfer the smallest increment of unbalancing pressure to another section of the gear that, in the absence of the footing frame, would be seen inclined to take its full share of the stress In short, the gears are self-adjusting to relieve and equaties all showerns at trains, and are consequently independent of the small inaccuracies that are impossible to collinate in the best commercial manufacturing operciminate in the best commercial manufacturing oper-

The ener was tested by means of a special hydraulic brake, the roduction gare bing interposed between the turbine and the brake, and in six test the brake herebyeard editivened by the gare at different speeds varied from 3,712 to 5,327. Since there is no way in which to measure the indicated horse-power of a steam turbine, it was necessary to establish the exact brake horse-power in some other way. Fortunately, it is a characteristic of the steam turbino that, as long as the speed and exhaust pressure are maintained contant, the absolute inlet pressure of commercialty dry steam is a very accurate measure of the brake horse-power the turbine is at every accurate measure of the brake horse-power the turbine is a very accurate measure of the brake horse-power the turbine is a very accurate measure of the brake horse-power the turbine is a very accurate measure of turbine is all, was subsett, of the state of speed, a constant vaccum was maintained in the exhaust plue, and the inster pressure accretepoding to different loads at this speed were determined From these tests the following results were obtained.

B. II P delivered by goar	B. H P of turbine as determined from in- let press, etc.	Ricioner	
3,713	3,771	98.7	
4,156	4,197	99 0	
4,576	4,622	98.9	
5,036	5.108	98.7	
5,486	5,567	98.5	
5,927	6,057	98 7	

A reliable check upon these results is afforded by the rise in temperature of the duth which the gave is lubricated since the transmission loss in the sparse is bettered and notice the same papera as heat in the oil 13 measuring the quantity of oil circulated and noting its rise in temperature, a close approximation to the number of British thermal units lost per hour is obtainable. When the spar was edivering £0.88 horse-power, 519 nounds of oil were circulated, with an average rise in tamperature of 28 days. For much the fitted was the total heat absorbed per hour was 164,268 British thermal nutts absorbed per hour was 164,268 British thermal nutts absorbed per hour was 164,268 British thermal nutts with the state of the sequivalent of a house-power, the total heat accounted for including the state of the product of the sequivalent of a house-power, the total heat accounted for including the sequivalent of the

reason With these results before him, Mr Westinghouse has made as investigation of the ecopessies with could be secured by applying the gast to the Onnerders "Meatr-tanis" and "Lustianis," which are safe-shable of evologing 70,000 here-power if the mans high est-cinary can be secured on board slip) as has been element of the secure of t

probably dose set empirity. If per cept, if so, the solval offsetive propelling juvice is only about \$83,00 horses proven. At the investigation provides mentioning from the use of the reducition grant, propelliers could be stalled that would have an efficiency of not less than 85 per cent; which means that the shack horse-power required for the same effective propelling power would be less than \$17.00-m serving of about 15 per cent. The per cent of the per c

equipment and the coal consumption on such voyage about one-servant to this economy at the propoller and of the shaft, there would be corresponding and even greater occomies realized at the trethics. For it is will understood that the equal solicionies in any treatments of the second solicionies in any treatment of the second solicionies and treatment the respective peripheral meeds of the rotating sisments. But the peripheral speed of the rotating sisments in the turbines of the "Manvistania" and "Lesitania" is only one-third of the speed common to large turbines used on land. This would make that to obtain the sificiencies common to the inter, the "Manvistania" turbines would require approximately aliatimes as many rows of blades, which would make as machine of prohibitive length To maintain the same speed of revolution and increases the peripheral speed of the turbines to that of turbines in land practice, the

of the turbines to that of turbines in land species, the rotors would have to be nearly of test in diameter. Now, the steam consumption of the turbines of the Valarenania is believed to be about 14.5 pounds per shart horse-power per hour; but it has been proved that in turbines of suittler capacity, operating at speeds which the reduction gear makes possible for marries of the contract of the co

te the eargo capacity.

But there are further commontes, as will be seen by reference to the illustrations on our front page, which show the space occupied by the present turbus equipment of the "Mauretania" and that uncommany it mail high-placed torbines combined with reduction generates a supplying the common of the property of th

comment a unnecessary and result result from the example. All the advantages on unresheat stansars would be realised also on naval vassels, together with other collateral advantages due to the fact that the high-speed turbins would not suffer the large drop in soon on which results, in the case of the present turbins, when they are operating at cruting appends. With the superier stams encouncy of the high-speed turbins the holder capacity would be reduced fully method, and with the same bunker capacity the radius of action would of rourse be enormountly increased—a consideration of the state of t

The Current Surplement.

Among the big things which the big State of Coul. formal professes are estimated. These hirds are discussed by C. F. Holder. Mendelt have and the origin of species are openiarly desumed by Prof. Out. With. Herbert. A. Humphrey writes on an internal combustion penus and other applications of a new principle. His aim has been to produce a pump of more simplicity and strength of constitution, in which the explosive force is exerted directly upon the setter, and in which no rotating givenies, one plants for an expensive to the setter, and in which no rotating givenies, one plants are to expensive the setter of the control type of pumps, which have been set to the setter of the control type of pumps, which have been set to the setter of the control type of pumps, which have been set to the setter of the setter of the setter of the control type of pumps, which have been set to the setter of the setter of

Scientific American

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30 0 10 05 4 8 03 58 31 0 8 06 2 +8 03 57 0 8860 0 2288 82 During December Halley's comet became hright nough to be seen with twicecopes Several have reenough to be seen with telescopes Saveral have re-ported views of it with four and three-inch telescopes Prof Philip Fox, director of Dearborn Observators, saw it during the total cellipse of the moon on the morn-ing of November 27th with the 3% inch finder of the

According to the Harvard Astronomical Bullstin No 379, Prof E. E. Baruard photographed the cornet with the Bruce steenope on December 29th, and finds upon the photograph a very faint tall in position angle 69 deg with a length of 10 min The tail was very sien der and straight

According to Prof E B Frost, director of Yorkes Observatory, Halley a comot will be visible to the naked eye about April lat. It will cross the face of the sun on May 18th at which time the earth will be plunged on may istn at which time the earth will be plunged in the comet's tail for a period of several hours. The time of the comet's transit will be rather unfavorable for eastern observations, but undoubtedly it will be for eastern observations, but unacountedly it will be observed from the Lick Observatory in California and through other western telescopes. The comet will be visible to the naked eye about April 1st in the morning sky just before sunrise. After it crosses the sun it will appear in the evening sky just after sunset

Atmospharia Misericity as Beurse of Pewer, Tutility of the scheme often promilected for nillising the electricity of the sthempoleve, this tession of many fluctuated volcations and the scheme of the sharle Electricity as a Source of Power.

What is declared to be the largest and most or-positive lettler belt eyes made for driving purposes has been recently abtyped from New York. The belt is \$80 atts large, a feet wide, three lyt thick, and was observed at a feet of \$1.500. To make the belt the \$1.500 yet 50 attsyst were required.

Correspondence.

THE PURT "ALL-BIG-SUN" SHIP.

THE PAIR "ALL-MI-607" SUTP.

To the Editor of the Scurstruc Aurences
In glanding over your issue of November 20th, I was
In glanding over your issue of November 20th, I was
truck by your correspondent's interesting articles, "A
Dreadmought of 1852" However, done it not seem
more logical to go back a year earlier to Extension's
"Monitor," which was without doubt the first "all bidgan" slip hulli. The "Reaches" was really a combination of the "Mortimer" and the "Monitor" being
the house and the property of the combine of the "Mortimer" and the "Monitor" being nation of the "Morrimac" and the "Monitor" being like her antagonist, a rand frigate, and resembling the "Monitor" in the matter of her turrets, therefore, it appears that the "Monitor" was the original dread-nought, and the present mighty vessels of that class are but the design of the great Swedish American saare not the design or the great swedish American en-gineer applied to occargoing vessels. For be it known that Ericason nover intended to employ the "Monitor" vessels for any other than coast defense duty Brooklyn, N Y Grande Ellis Chonin

SIGRTING A RIPLE.

To the Editor of the Scientistic Amer

I was interested in Mr Woodland's article "Sighting a Rifle," in your January 22nd laste, and I would ilke to mention a point which I think he has over-icoked, viz., the immp of the rifle This term refers a angle through which the barrel receits while to the angie through which the barrel receits while the projectile is traversing the barrel in off hand shooting, the ride receits upward, and sometimes stightly sideways about a center which is probably a little forward of the hutt plate. The correction for this should be applied to both sights, and directly pro-portional to their distances from the center of recoil, but as the rear sight is very near this center, and has little vertical movement due to the jump, it is su ittle vertical movement due to the jump, it is sum cleant to storate the front olght through this angle (This is done by the manufacturer, notice the high front sight of a six shooter which always has a con siderable jump) Mr Woodland's plan was ordently to make the correction on the rear sight only, and while this would keep the front aight lower, and would correct the dagle of jump, it still introduces a constant vertical error at all ranges—an error equal to the vertical movement of the front sight the la small, and perhaps negligible for the 0 22 call bers, it would still affect his calculations slightly The builds would strike a little high, tending to intersect the line of sight bearer in the saccading hranch and farther in the descending hranch of the trajectory Chappaqua N Y A. W BEELL

CURIOUS PACTS ABOUT SQUARES AND GUBES.

To the Editor of the Scirwittic Amenican
I have discovered the following curious facts about
aguares and cubes. These facts, in my opinion, are
interesting from a selentific point of viow besides beneg of some practical use I shall be very glad to
have you publish them If you doesn them of sufficient worth.

1 To be a square a number must have for its unit's digit one of the digits 0, 1, 4, 5, 6 or 9 This, irse, is well known but I put it down as an aid in understanding the other facts.

- in understanding the other facts.

 2 To be a square a number, if its unit's digit be
 9, 1, 4, 5, or 9, must have for its ten's digit 0, 2, 4, 6,
 or 8, 1 a, the ten's digit must be zero or an even
 number It the unit's digit be 6 the ten's digit must number If the unit's digit he '6 the ten's digit must be 1, 5, 7, or 5 is, an old number If the unit's digit he 5 the final digits of the number must be 08, 255, 6085, or 685 If the units digit he 6, there must be an even number of zeros at the end of the numbers. 3 A number, to be a square, must have as meand-der whan "nines are cast out" of it either 0, 1, 4, or 7 the same remainder when dirided by 8, as when the num-sums remainder when dirided by 8, as when the num-
- same remainder when divided by 9, as when the num-per in divided by 9, this test is easily applied by divid-ing the sum of the digits of the number to be tested by 9. To this test I can give an algebraic proof 4. A number, to be a cube, must have as remain-fer when "lines are cast out" other 0, 1, or 8. This fact also I can prove by means of algebra. I can furnish you with a device, if you dealer it, by

I can furnish you with a device, it you desire it, ay means of which, the squares of the numbers 1 to 25 being given, the squares can be written off in order of itôtium without any multiplications

Normal School, Peterbore G H Krany

MIM PECK AND MRS. WORKMAN.

To the Editor of the Scientific AMERICAN cent of the lower north peak of Mount Huascaran in Peru in 1908, Miss A Peck wrote in Harper's Magazine and in other periodicals and papers the following

regarded as certain that Huascaran is "it may no regarong as certain that Hussevaran is above 23,000 feet, hence higher than Anonesque, 23 800 feet, and the lottiest mountain known on this hemis phere If, as seems probable, the holight is 24 000 feet, I have the hour of hreaking the world's record for mon as well as women." Knowing from her own statement that Miss Peck made no instrumental observations above 19,600 feet on Husscaran, and belloving, furthermore, Aconcagua on Hamcaran, and bollowing, Turthormore, aconcagua to be the bighest mountain of the Andes, I decided to test the truth of these assertions by sending supert European engineers to make a detailed, up-to-data trilation of the two summits of Mount Hunscaran

anguation of the two summits of Mount Husseafan.
The only previous known measurement of this
mountain was made many years ago, whith is said to
have given a height of 22 180 feet for the south or

have given a height of 22180 feet for the nouth or higher ensmit.

Prof. 8chrader, who a few years ago made the most subbentle measurement yet made of Atonesqua and M Honri Vallot, both well known Fronth selections and heads of the Societies Generals of Kinder of the de Tra varx Topographiques of Paris undertook to assist in setting any thou compelline, and says the matter their

lose personal attention

M de Larminat, expert engineer who has carried m de (Arminat, expert engineer who has carried out important survey work for the above socialty was scienced as chief of the mission in July 1909 ac companied by two other competent topographers, he started for Peru

Favored by good weather conditions and assisted a to transport by the Peruvian government they executed a careful and detailed survey from the sea to Ynngay and by actual measurement established the ineights of four stations in the Black Cordillers, from each of which they triangulated the two peaks Huascaran, so that Huascaran now stands as one of the most accurately measured high Andean moun-

The results are Height of north peak climbed by Miss Peck, 21,812 feet, of south peak still unclimbed, 22 187 feet These figures may vary by a few feet but not many when the calculations are finally gone over by M Vallot for verification

Mount Aconcagua nearly 22,900 feet, still remains, as I predicted and as Sir Martin Conway and other Andean explorers have always maintained, the highest peak of South America

Miss Pork's highest awant to date therefor stands peak Huascaran 21812 feet instead of 24 000 feet, as she estimated it, and she has not the "honor of breaking the world's record," elther for men or women, for my two highest ascents of respectively 22 568 and 23,300 feet debar her from that honor in the case of women while a number of men have made ascents exceeding her highest

FANNY BITTANK WORKMAN

Official Meteorological Summary, New York, N. Y., January, 1910,

Atmospheric pressure Highest, 30 79, lowest 29 20, Atmospheric pressure Highest, 30 79, lowest 29 20, mean, 30 10 Temporature Highest 51, date 21st, lowest, 5, date, 5th, mean of warmest day 46, date, 21st, coolest day, 18, date 4th, mean of maximum for the month, 38 8, mean of minimum 25 0 absolute means 324, normal, 306, daily excess compared with the mean of 40 years, 18 Warmest man temperature of January, 40, in 1880-1890, coldest mean, 23, in 1893 Absolute maximum and minimum of Jaunary for 40 years, 67 and 6 Average daily excess since January 1st 18 Precipitation 561 excess alone January lat 18 Pre-epitiation 561
greatest in 24 hours, 158, date, 13th 14th, average
for January for 40 years, 380 Arc unutated excess
alone January 1st, 31 Greatest pre-cipitation 615,
in 1883, least, 115, in 1871 Wind Prevailing direction, northexest, total movement 9153 miles average
hourly velocity, 123, maximum velocity 58 miles per hour Weather Clear days, 7, partly cloudy 10 cloudy, 14, on which 0.01 or more of precipitation of curred, 14 Snowfail 188 Mean relative humidity 771 Sleet, 5th, 29th Dense for 5th, 21st, 29th

The centenary of the Argentine Republic is to be celebrated by an international agricultural exposition which is to take place this year. The exposition is to which is to take place this year. The expansion is to be oponed at Palermo (litunos Ayres) on Friday June 3rd, 1910 and will close on Sunday July 31s. 1910 The exposition will be divided into eight sections I Goology, Hydrology, Climatology and Geography

In relation to Agriculture 2 Machinery and Implements 3 Rural Engineering 4 Vegetable products 5 Animal products 7 Means of promoting agriculsecial section for seeds

Entries and application for space may be written in Spanish French English, German or Itatian, and should be addressed to the Secretario de la Exposición Internacional de Agriculture do 1910 Florida 318 Buenos Aires República Argentina These entries of applications for space must be made on the printed forms which the Secretariat of the Exhibition will torms which can secretarize of the Exhibition will furnish to all persons who may apply for thin at the offices of the Rural Society at the address mentioned. For to the Argentine legations and consultate shroad Entries and applications abroad can be presented at the Argentine legations and consultate general on the sums dates and under the same conditions as any



THE LOWE OBSERVATORY ON ECHO MOUNTAIN, CALI-FORNIA. U. S. A.

BY EDGAR LUCIEN LARKIN, DIRECTOR



Do you want to imagina that you can almost near the earth in its turolog? No word printed on paper can convey to the mind of a reader this impressive siloner above the clouds. When Beho Mountain is allone above the clouds When Scho Mountale is within a heavy cloud the darkness is that of night From sunset until dawn when clouds are excessively dense the jet black solitude is indeed welfd. The mind is sixway profoundly impressed and imagina-tion is vivid and siert. In the midst of this quietnds and darkness lights are suddenly turned on by a dis tant finnt. Night turns to day. Huge masses of met and darkness light turns to day. Huge masses of met has and wires in a dynamo in Los Angeles, in rapid olution, cause the light to flash out on the moun tain top. The observatory is on a sharp peak between two immense canyons, deep and wide. The mouths of these chasins cut in herculcan rocks are blacker

midnight than the imagination can conceive.

Who knows the meaning of the word there. None in able to understand what ejear means if fiving in a valley liters on Echo Mountain the atmosphere is so clear that the stars seem near enough to fouch, and the mountain air wonderfully pure glow with a brilliancy all unknown to those living any whore near was level. At all times, wave immediately after copious rains the dust envelope aurrounding the earth is visible beneath

it covers the ensea. To us on the mountain top it seems of times as if every humon would thoka in this layer of dust. Above us at night, buge diamonds, Arcturus and Spica likewise, and above all the glaot star un Canopus, gittering distant south fashing its rays over myr lade of wave crests tossing in the Pacific Ocean the brightest star in the relestial vault, cannot be New York The magnifi cent constellations of Orion, Herenies and the ful that words are powerless to describe the is astonishing to behold the apparent nearness of the galaxy Monntain perspective the purity of the air and freedom from water vapor during Iwo-thirds of the year com-

the snound of the moun

to form au ontical illusion At times this decenapproaches a night mirage, and c tive influence approaches a night mirage, and one scenar to be walking among the very stars. Here we was the many and the withing hour is at smoot a sunset of orange and flower indeer plains and watery waster beyond. Round and about the winter solution the walker disk may be seen standing on the sea. Soon half of the might sphere only is visible. The last view is comparable to an are light. Then only no the first magnitude sizes are seen flashing between distant peaks. Be

stars are seen maning between distant peans. Be-fore the last gleam of the sun has vanished, Alde-barna, Altair, Rigel and Procyon filumine the sky Many gignalic sentions, peaks, and ammits fit their hade within a radius of a hundred miles of the local. These lie to the cast to the north, and toward the son in the west. The effect is hat of an amphilibeone sea in the west. The effect is hat of an amphitus-ater. The souls is open even down to the beach At annect large steamers look small indeed when compared to the face of the adjacent and Artist have journeyed to Echo Mountain to paint its numer splendors to imitate nature on canvas. But brush rpsendors to imitate nature on canvas. But brush ond possil are as impotent as words. The view of tlouds presented herawith is one of hundreds of thousands. When the first rays of the rising sun striks such cloud banks as these prismatte colors are seen that defy description—gorgeous oranges, carnations, and heliotropes beneath The effect is hightened by the singing of binds over the caryons. As the sun rises above the horizon the blossoming plains below, the domes and spires of los Angeles and Pasadess, surrounded by acres of roses, with bods of delicate white the come visition. As the clouds are dispelled, miles after miles of trinde cipruses, pepers, orangs, lessons, apriless of the context of the rot, almond, wainut, prune, peach, pear, and necta-rice trees, together with hundreds of long lanes, drives and roads adorned on both sides with tall,

drives and roads adorsed on both sides with tall, graviful event, byte trees, are seen Carpel a floor with jet black valvel, and throw down upon it a myriad of diamonds in wild combision, and perhaps you may conceive how the densely packed Milky Way appears from the observatory Millions is a word becoming astronomically obsolute; billions is a word becoming astronomically obsolute; billions of stars is an expression much more nearly tree of the Milky Way Billions of some appear in the influt deeps of the Galaxy Those constitute the aparent counte floor, the base of Nature, and of the stellar structura. In hundreds of areas, there does not seem to be piace for more stars. Millions are flowed in the star of the or better, over the rim of the eastern canyon. Then millions of stars seem to be pouring into the depths of tha reck-zero abyze descending low beneath the observatory. Floods of stellar points flow downward, as seen in the revareing sysplexs.

The observatory on Mount Lowe is 70 test in land. The peak had to be cut down to admit the foundations. The telliscope in a fine Alvan Clark equatorial, with identical tellistics of the cut of the

tions. "The tollinone is a fine Airum Clark equatoria, with 3-filance holicities. A fine Branchest telespectroscope is here, and many other instruments of the control of the state of the control of the state of the control of Bob Moninals. The length of this railway is 5,000 feet, vertical ascent 1325 feet, and time of ascent and deasent is finites. The statitude of the observatory B 4,500 feet, and the of miner of the court and deasent is finites. The statitude of the observatory B 4,500 feet, and is of miner from Pasadens, 12 from Lee Angules, and 15 from the inserted short interest above.

and Altadena iles in between or hards of orange trees Golden fruit may be seen during five mouths of each Almond trees in bloom and orange flowers and ripened fruit are objects eliciting the

This observatory was founded by the dean of living aviators, Prof.

B C Lowe, in 1894 Dr Lewis Swift was astronomer in charge until August 11th, 1900

4 Kinemategraph Biffe Target,

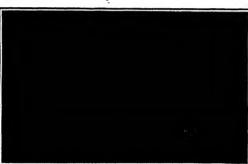
Among the novel used for which animated photographs have been utilized. graphs have been utilized, one of the most ingenious is that recently perfected by two English inventors, Mesura, J Paterson and J T Musgrave This is its application to rife-fire application to rifle-fire practice, the idea being to render the eye of the marksman keener, and to enable him to be more exert in the quick handling

The "bloscope target." as it is called, is of very sim ple construction and opera-tion. There are two rollers, upon which is wo ers, upon which is would a sheet of paper of any de-sired size, like the films of a camera, the clear space between tha two rollers comprising the screen upon which the pic-tures are thrown The

tures are thrown The lantern in placed behind the markmann in such a way that their movements do not interrupt or interes with the projection. I munchatary behind this refer with the projection I munchatary behind the lastantamously conveys the value of such short to an indicator at the frings point. The value of these hits may be graduated as required. Thus the maximum points corresponding to a buller eye are given for a fatal shot, another value for inflicting upon the objective a moral award, and the projective and the projective and the sum of ablement, and so on. The indicator not only on municates the individual hit, but at the completion the round, or practice, registers and gives value of hits made.

value of his mans.

The range can be varied from 15 to 25 yards as desired. The paper screen as it is destroyed by the bullet perforations is wound up on the second roller. The self vectoring mechanism behind the screen is so syranged that it absolutely synchronizes with the mereprangan tast it accountsty syncarronness with the sevents of the object in the picture, at which aim is taken, so that there is no possible chance of a wrieng value being given for an individual shot. The indi-cators are placed immediately, shows the unrimment bend at the firing position, and a fatal hit can be signified by the ringing of a bell. See with the ordinary



Grand panerams from Eche Mountain. Leoking due south from the Lowe Ob Land area is 900 square union. The cloud is exactly over Panadena. The observatory is shown in the foreign right of this view

THE LOWE CREEVATORY OF MODE MODETAIN, CALIFORNIA, U. S. A.

a pavement of starry sand. I never really saw this aidereal base until with the telescope up hers. After sevaral days of rain, the atmosphere is swept clear of sevaral days of rain, the atmosphere is swept clear or dust Then one is really within cominc deeps when the tolescope suddenty awasps over fathomises inter-stellar chasms, doors or windows through which one apparently looks into the very bottom of space. These apparently looks into the very bottom of spece. These areas are absolutely black. No sensation within the culir range of stellar research, at the hour of a monatian mindaint, is so completedly overspowering as ha vision of an abyes in the stellar foor Rousel and about these blackened wastes, there are consequently of the stars are opined to be suffered to the vision of the stars are opined to be suffered to the vision of the stars are opined to be suffered to the stars are opined to be suffered to the stars are opined to be suffered to the suffered to little star—the sun The giant nebula of Orion is a mass of starry la-

fabric loaded with glittaring points.

An astronomical telescope reverses all objects b An autronomical telescope reverses all objects before it. The rotation of the earth is very apparent on Robe Mountain With high powers, the stars go racing across the field of view. An incredibly starting affect is obtained when the telescope in set upon the Gelaxy is obtained when the telescope is set upon the Galaxy or Picindes just as they rise out of some distant peak. buil's any target. The pictures, which have been specially prepared for use with this apparatus, are of such a character as to develop the calerity and certainty of the marksman's aim to the supreme degree. o the enemy appearing on the picture first at a relative 100 yards range. He drops

on his knee and fires point blank at the marksman a certain number of rounds, corresponding possibly to a complete charge of his rife magazine. The marksman using the target raises his rife immediately the kinematographic scout is seen, but does not commance firing until the scout opens fire, the ap-pearance of a puff of smelts in the picture indicating the comment

of firing
The scout then retreats
at the double to a distance corresponding to 200 yards range, when the same cycle of operations is repeated The scout then retires once more until he eaches a point correspond ing to 500 yards range, and the same tactics are once more carried through It will be seen that in each phase the target becomes decreased in airs, according to the range, and at the maximum range offers s vary small object to the marksman Moreover, the fact that the latter has to discharge the whole of his rounds in the short period rtween the picture commencing and finishing firing at each distance, in order to score, indicates that aiming and firing must be accomplished very quickly Yet it has been found that in the course of hut little practice, the of hut little practice, the marksman can pick up the range and conform with the firing conditions so ex-perity that about untoely per cent of fatal shots can be got in with each round at the respective ranges. The invention is also ap-plicable to training in re-volver shooting, and for

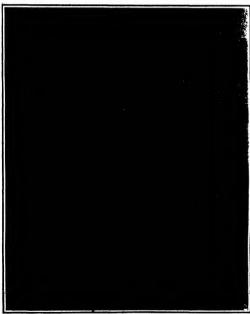
plicanie to training in re-volver shooting, and for this work an ingeniously auitable film has been pre-pared. It portrays a conauitable film has been pre-pared It portrays a con-flict with an armed house-breaker The hurgiar ef-fects his entrance through the window, under which in the room, a roll top deek is drawn at an angia In the course of his work In the course of his work the hurgiar is disturbed, presumably by someone entering the apartment. He instantly shields himself behind the desk, exposing but his head and shoulders, and cocks his revolver The burgiar's disturber is represented by the marksman at the fir-ing point, who at tha psychological moment the psychological moment the burklar is about to fire, empties his revolver. In this act the burglar pre-esuts a fatt-sleed target, with his pretruding head and shoulders at a few yards rauge. The burglar having emptied his arm turns to ecospe through the window, but in the act of frompting from the city

the window, but in the act of dropping from the sill, to which he clings by one had been as the head, and drawing his revolver case more, first. The markanian waits until he ones the burgiar's head right sponed and just shout to fir, and then shoots. In this case, wring to the greater rather and the sized area offered by the man's head and allocations in prolife, the area offered to the marks and and allocations in prolife, the area offered to the marks.

man's aim is somewhat small. The burgiar indicator represents in silhousts the head and shoulders of the burgiar in the two firing pecitions, and the vulnerable points of this part of the anatomy are shown on the adicator, so that the firer can instantly determine, whether he has struck the target in a fatal spot, has



de in this picture are short 1,000 feet below the hallding. Oreans true orch



This is not a volume in exprise but a forest fire 8 miles wast of the Lowe charactery, which fire started in La Canada Walley and traveled in way to the manualt, burning for several days. Colosest famous and masks located like a volume in action.

THE LOWE CHERVATORY ON BOHO MOUNTAIN, CALIFORNIA, U. S. A.

inflicted a mortal wound, or has either missed entirely

inflicted a mortal wound, or has either missed entirely or only failfaid a feel wound.

The projection is automatically controlled. The lanters is electrically driven by means of a small mo-tor, and this is operated from the fring position by means of a small switch. The same picture can be

projected time after time, there being automatic do vices for winding and rewinding the speel preparatory g and rewinding the spool preparatory Being electrically driven, a uniform vices for winding and rewinding ine apon prepassion; to projection Being electrically driven, a uniform projecting speed is secured, and as it is directly under the control of the marksman the apparatua is only set in action when required

ed to an indefinite exient and the variety of pictures that can be used for im proving the fire of the proving the fire of the marksman is endless it can be adapted for tudi-vidual or company firing, and very realistic scenes can be pictorially pro-duced. The application of the bioscope to this place of military training often been advocated and indeed attempted, but stienspied, hitherto it has been found difficult to evolve a practi-cal simple apparatus. The British War Office has investigated and subjected the invention to searching tests, and has ascertained that marksmanship can be rapidly improved by this means that its general introduction into the serv ice is being contemplated.

A new method of bond ing new concrete to old was described by Mr Frank Barber, of Toronto, in a recent article in the Canadian Engineer This consists in piacing bags of cracked ice on the last ces of concrete placed at night, thus reducing the temperature of the con crate and, consequently, retarding its time of set ting, so that on the next morning the surface is still plastic and the constill plantic and the con-crete then placed will set in one mass with the old. The invention of this scheme is credited to Mr O L. Hicks, when he was contractor for a reinforced concrete truss bridge in Ontario As all of the members of these trusses. were of relatively small cross section the ire bags were easily placed in posi-tion, at the end of a day's work and it is stated that work and it is stated that the method worked very aucressfully To what ex tent it could be applied to heavier work is not as yet

Hitherto dew has been used as a beverage only in poetry, by the sun, flowers, and butterflies it has re-cently been robbed of all its postle character by be its posite character by be-ing used for the refresh ment of English soldiers The English administra-tion at Gilbraitar, where water is very scarce, now collects dew by the follow ing very simple method A large pit is dug in the earth and covered with dry wood or straw which, In turn, is covered either with earth or with sheet iron. The straw or wood serves as a heat insulator and effectually prevents the conduction of heat from the ground to the layer of earth or the sheet

S. A. iron, above Consequently
this earth or tron cools
after sunset much more rapidly than the ground so that its temperature soon falls below the dew point of that its temperature soon falls below the drw point of the surrounding air Hence dew is formed upon the iron or the layer of earth in very large quantities. The water thus obtained is drained off into reservoirs and after clarification is used for drinking

MORNING AND EVENING STARS FOR 1910

BY PROF. FREDERIC R. HONEY, TRINITY COLLEGE

The popular expression 'morning and evening stars while signifying those planels which at different periods lliminate our skirs, the observer will natur ally include in his study of the heav on the fixed stars nance indicates that they will be invariably

found in the same places on the celes that sphere. Their positions in the heavens may be sooner fixed in the memory by first observing the stars of higher magnitude whose conspicu on brightness casily distinguishes them from those of varying degrees of lesser brilliancy in this way the heavens may be triangulated visually, and in process of time all the constellations may be easily identi-fied. For such observations a star map is indispensible, and the posito right assensions and declinations which are given in the Nantical Ai equator from which declinations are measured may be delermined ap-proximately by observing the stars which are may it on the star map, and in the same way the position of the first meridian intersecting the of the first meridian line resceting the closistic equator at a point from which right ascendons are measured, may also be defined. Following this method as veu eighths of the celestial sphere (at latitude 46 deg.) will come within the range of vision, and the heaven may become any become one of the composition of the distances to the distances to the fixed stars are so great that (except to the astronomer) their apparent positions are not disturbed when the earth reaches the apposite point in its orbit—a distance equal to about one hundred eighty six milling miles. For purposes of observation the carth may therefore be regarded as

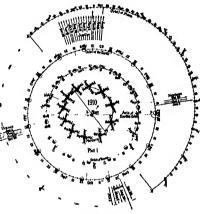
the center of the celestial sphere around which the stars appear to revolve once in a sidereal day, which is nearly four minutes shorter than an ordinary day, a nearly four minutes shorter ham an ordinary day, a difference due to the re-volution of the earth around the sun once in 165% days During this period the earth makes 3061, rotations out its axis. As a conse-quence the stars rise nearly four minutes carrier every day, and during the year the major part of the celes tial sphere comes within the range of vision at any

assigned hour of the twent thru The positions at any plausia are continually changing, and in or der to discover the restion of the heavens in which to search for them their situation relative to the sum and earth should be determined as illustrated in Plots 1 and 2. The piols of their orbits have been printed in the pilols of their orbits have been printed in the Sib 1971th Array on the blesses of the fol-lowing dates March 11th, 1906, Pebruary 10th, 1908, American Coll., 1908, and March Miller Period of the Sib 1908, and March Miller College of the Sib 1908, and March Are shown for every day of each year. To english the sib 1908, and a sib 1908, and the pilolic sib 1910 include. The orbits of all the pilon-cial for the fire consecutive years from 1906 to 1910 include. The orbits of the aster-ulds which are between those of Marc and Quiller, Shorry Harman, and Neyton, are too suntil to be visible to the naked eve, the largest of the suntil to be visible to the naked eve, the largest of the original that hundred being not more than five hundred miles in diameter. Several of the orbits are very eccentric and inclined at large angles to the plane of the cellpile

in order to bring the pites of the orbits of the phenets within the limits of the problem of the phenets within the limits of this page, the orbits of the terretiral pitestes, which include Mercury. Yenus the earth and Mara, are drawn to as large a scale as the space permits silice the diameter of Neptum's orbit is libity limes that of the earth, the pite of the orbits of the major pianets, including Josher Salver, Iramis and Neptume, are drawn to a wate which is very much reduced. In this pite the orbits of the arch and Mars are repeated by the reduced each, the region of the sarvoids or unince planets is indicated and the piota together show the outlimity of the solar system. The THE SET VID PLANTS

plane of this paper may be taken to represent that of the celliptic or the earth's orbit, and if it be placed in n horizontal position a planet which is on one side may be described as being situated above and on the other side as below the reliptic. In the plot of each orbit the full line represents that part which is above,

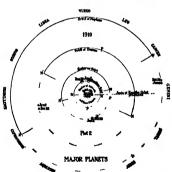
and the dotted line that part which is below the eclip-tit. The ascending and descending nodes N and N are respectively the points where the planet passes from the space below to that above, and from the space to that below the addition and P. the perhalical above to that below the ecliptic, and P. the perils



PLOT I POSITIONS OF THE PLANETS.

A fine joining the points N and N', the line of nodes, is the intersection of the plane of the planet's orbit with that of the ocliptic To avoid confusion, only a portion of this line is represented, except in the case

It is obviously impossible to represent the diame of the planets by the same scale. Even those of the giant planets Jupiter and Saturn would shrink to mere The same may be said of the sun itself in Plot



PLOT IL PLANETARY ORBITS.

2, but in Plot 1 its diameter (\$66,400 miles) would be a. out in Piot I is diameter (see, see mailes) would be correctly represented by a measurement a little more than one-half of c, which is the linear eccentricity—the distance from the sun's center to the center of the earth's orbit

The earth a mean distance from the sun (929 mill miles) is diminished by a little over one and o million miles at peribelion in January; and in

by the same distance at aphelion in July The center of the orbit is at a. At a velocity of 18.5 miles per second the earth moves each day on the average nearly 1,600,000 miles, with an increase of velocity at per-

inution at sphellon; making the com-plete revolution in 365½ days. The position of the earth is shown at in tervals of four days at Greenwick, noon, and intermediate positions and dates may be interpolated by subdi-

The plane of Mercury's orbit is inclined at a greater angle (7 deg.) than that of any other of either the terrestrial or major planets. Its eccentricity is also greater than that of any of the planets. By the eccentricity is meant the distance from the center of the orbit to the sun (the linear eccentricity) divided by the semi-major axis. The linear eccentricity is 74 million miles, and the iongth of the major axis is 73 million miles. Mercury's mean distance from the sun is therefore thirty-six million of 74 million miles respectively at perihelion and aphelion. At perihe-tion the planet moves at a velocity of thirty five miles a second, which is diminished to twenty-three miles a second at aphelion Mercury's orbit is a marked illustration of the first two of Kepler's three laws First The orbit of each planet is an el-lipse, with the sun in one of its foel tipee, with the sun in one or in no. Become The radius vector (i e, the orbit radius whose length is continually changing) of each planet describes equal areas in oqual times. For example, the area of the triangle with the sun as its vortox, and with the sun as its vortox, and with a base equal to that part of the orbit

included between the dates of August 30th and Septimber 7th, is equal to that part of the orbit he same vertex and for a base that part included between the dates October 9th and October 17th. In conformity with the second law, the issues of the base of the triangle is continued to the second law, the issues of the base of the triangle is continued the law of the base of the triangle is continued to the base of the triangle is continued to the second law.

the triangle is continually diminishing frem periholion to aphelion, and increasing from aphelion to perthelion, which accounts for the rapid variation in the phase's velocity. Mer cury's revolution around the sun is accomplished in very nearly eight-eight days (871). This is repeated over four times during the year, and four dates are attached to each good continuous distriction. The include of the production of the present variation in the phase's velocity the politions are in the phase's velocity of the present place of the perturbation of the perturbation

shown for every second day

"Even as "The erbit of Venus is inclined to the plane
of the erliptic as an angle of 34 deg. The

executricity is less than that of any other
planes, and is barrely visible in the plot, the

distance from the sun to the contro of the

oral is less than a half a million miles as

a someoteneous, the velocity of the planes in the

control as a sense distance of 47 a million miles

oral at a sense distance of 47 a million miles orbit at mean distance of 672 million miles is nearly uniform at the rate of 219 miles presented.

The period of revolution is 2347 second.

The period of revolution is 2347 days. The dates outside the orbit are those which belong to the first revolution, those within, to the second revolution, and that part of the orbit included between the positions of the planet for the first and second revolution of the planet for the first and second revolutions represents the distance travers in seven-tenths of a day MARK

The orbit of Mars is inclined at an angle of 1.85 deg.; and the center o is 13.3 million miles from the sun. The mean orbit velocity is fitness miles per second, and the mean distance from the sun is 141.5 million miles. The

period is 1.85 years.

The inclination of Jupiter's orbit is 1.8 dag.

The inclination of Jupiter's orbit is 1.8 dag.

The inclination of Jupiter's orbit is 1.8 dag.

miles.

The first inclination of the inclination period inclination of the inclination of the inclination of the period of two period of revolution is 1185 years. The direction in which the planet is soon from the sun is shown at increase of twenty days.

Sadurate orbit is inclined at an angle of 3.8 dag.

Reduced in the inclination and the mean distance is 186 million majes. The planets relapions and distance is 186 million majes. The planets relapions and distance is 186 million majes. The planets relapions and distance is 186 million majes.

CURIOSITIES OF SCIENCE AND INVENTION

A STREET BAILWAY AUTOROSILE.

le street railway has recently be installed for regular passenger service between Mands-ville and New Orleans, i.e. The cars are each fitted



A STREET BAILWAY AUTOMOBILE

ing them practically automobiles on rails. The line is 16 miles long, and steam motive power has been in-stalled in order to reduce the cost of maintenance. Two street automobile cars built as an experiment have proven so successful that more are now under have proven so successful that more are now under construction. Each car is built to seat twenty-two people, and the expense of maintaining the line under present power permits of a large saving over the ordi-nary electric street railway maintenance.

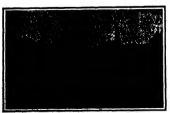
GALILEO'S TELESCOPE.

Just about three hundred years ago, Gallieo exhibited a telescope which he had used in studying the and planets. This was not the first to



THE FIRST ASTRONOMICAL TELESCOPE.

ver built, but it was however the first telescope to be used for safronomical purposes. The accompany-ing engraving shows how the telescope looked. This type of telescope differs from the present safronomical type in using a concave instead of a coavex eyepice, so that by a combination of but two lenses, the object glass and evenlece, he was able to view objects right



SCHOOLS PROPERTY BY MATCH-PARKER SPEAKED WHERE

side up, whereas in the present astronomical tale-scopes objects are inverted. The Galliean type of tele-scope is now used in the ordinary opera glasses. With this crude instrument Gallieo was able to establish the fact that the spoon is a round body with its surthe fact that the moon is a round body with its sur-face broken by mountains, that the Milky Way is com-posed of countless stars, that Yeaus and Mercury have phases little the moon, and that Jupiter has a number of satellites (four were discovered by Gallico). To bim Setura superared to be a triple planet. This pus-siling phenomenon was explained fity years later by turgyess, who sincovered that the planet was sur-lyspess, who sincovered that the planet was surded by a flat ring

AN EGG WITE A TAIL.

Occasionally, for one reason or another, a hen will lay a "soft-shelled" egg, but one with a tail, fike that shown in the accompanying photograph, is decidedly unusual. This egg was evidently the last or



AN ROO WITH A TAIL.

a clutch, and, though the ben lacked material for a shell, she had a surplus for the shell lining, or egg

A FROMEN TRESPRONE CARLE

A FROSEN TREEFRONE CABLE
The accompanying photograph shows the effect of
ice pressure on a twenty five pair lead telephone cable
The cable was located in a three-inth iron pipe, and
was run underground for fifty rest between the terminal pole and the manhole in the street. Owing to a fault in the construction of the interni, the pipe did not drain into the manhole, which allowed water to



THE RYPECT OF ICE OF A TELEPHONE CABLE

Last winter being an extremely cold one caused this Last whiter being an atternesty cold one caused this water to freeds in the pipe, the pressure retubing the colds out fait. In several places there was a quantity of small stones and gravel in this iron pipe and so strong was the pressure of the leve in the pipe that these stones were forced into that armor of the colds as though driven in by a hammer. The wires had the until pipe that the confidence in the pipe that the pipe for a distance of twenty feet.

MOTOR SCOOTERING.
Some years ago an amphibious craft was invented at
Great South Bay Long Island which could be manevered on ice as well as in the water. It was in reality an icebest provided with a flat-bot-

tomed hull which would foat the craft in case of encountering a bloweratt in case of encountering a blow-hole or broak in the ice. The sport proved to be very functioning, par-ficularly the peculiar senation of plunging off the ice into the water and then elimbing back again. The and then climbing back again The "scooter," as this craft is named, is now undergoing further develop-ment. Instead of depending upon the sais for power, Mr Nat Roe of the san for power, Mr Nat Roe of Patrhogue, L. I. has equipped his accoter with a 30-horse-power motor and a spurred wheel, which digs into the ice and drives the craft along He claim, to have traveled over the ice at a rate of 90 miles There is so m

water, but the sport consists in leaping gaps in the ice by the sheer momentum of the craft He has leaped gaps of over a hundred feet in this way. The motor scooler possesses an advantage over the motor sled, because it cannot slak in case of braking through the lee, and over the sall scotter in the fact that under its own power it can be taken home over snow-covered roads when the cover troops (fred of

LARGEST PROJECTILE IN THE WORLD

The accompanying illustration is of more linn ordin ary interest from the fact that it shows the largest



LABORET PROJECTILE IN THE WORLD

and heaviest projectile in the world being the hugo 5-loot, armor plerting whill first from the Obited States governments great thints rifl. This giant shell and powerful kind an considered two of the most destructive and dendiv engines of warfare in exist destructive and dendity engines of warfars in exter tene. The unusster 16-lnd rifle the only one built so far is now at the Sundy Hook Proving (frounds, and has only been fired a tew times. The lunge shell of steel can be juried a dictance of 20 miles or more and weighs 2 100 pounds—the powder charge is nearly 500 pounds. The cost of firing one shot reaches in the neighborhood of \$1 000—it is not probable that this type of gun will be used but rather the 14 hich for the main coust defences of the Panama Canal and possibly the Philippins. This formidable and long range weapon though capable of firing so tremendous a projectile is too costly and fires too slowly for modern

INTERLOCKED WOOSE ANTLESS
A curious veite of a famil battle between two bull moose is shown in the accompanying illustration. The battle was fought in the Kenni Peninsula Alaska a few years ago. An indian was attracted to the spot by the noise of the encounter, and on nearing the two antagonists he found that one had broken its neck during the striggle and lay dead on the ground white the other partly exhausted was making desperate of forts to free his horns. After killing the latter moss the indian tried in every way to separate the antiers but found this to be impossible. The interlocked but found this to be impossible. The interlocked antiers are soon to be exhibited in the collection of heads and horns in the new Administration Building of the New York Zoological Park. The larger pair of horns has a apread of 69½ inches and the other of



RELIGIO OF A BATTLE BETWEEN TWO BULL MOOSE

THE DESIGN FOR THE NEW QUEBEC BRIDGE

COMMONPLACE IN APPEARANCE AND COSTLY TO BUILD

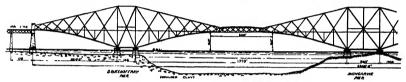
The collupes of the long, cantilaste bridge at Quicker August of the Nort, was at once the structured and mose final entertropic to all the history of bridge out attraction motion. When that independ structures broke down under the earn which tands appared from which the North State are likely independent of the state of the state of the control that rights famous lives and many millions of deligence has being the state of the state of the control that rights famous lives and many millions of deligence has the state of the state of the state of the state of the control that the state of the state of the state of the control that the control that the state of t

An investigation of the facts by a Royal Commission revealed as the cause of the collapse faulty design of the compression members—It was ascertained that the slightest attempt to combine the beautites with the under The faulty structure which collapsed had at the collapsed had a second to the collapsed had a retructurally and snathetically correct, and although the borth Bridge has been made the subject of much crititism by the arriest and the arributes, it must be regarded as baving distinct claims to beauty when compared as on the accompanying page, with the new

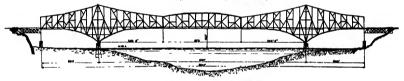
garded as having distinct claims to beauty when compared as on the accompanying page, with the new pinan for the Quebe Bridge
II wend seem, however that the Board has some doubts as to the merits of its own work, for it now harder competitive pinan from contractors which are to be filled by Bay 1st, 1310, the pinan which are to be filled by Bay 1st, 1310, the pinan which are to be filled by Bay 1st, 1310, the pinan beauty and a the contractor moment times after a pinal sit 5000 of the produce of the pinal sit of the pinal sit of the produce of the Board dispersionable firms to furlable them with new plans in one-sixth the time and for neithing?

The lay of the land at the Quebec crossing is such to make it almost certain that a thoroughly rigid pressure during high gales, and particularly is this provision necessary to theare safety during sweeten. The bridge which falles was only 87 feet what the small width was a large contributing cause to the visiting of the structure during exection, which preceded its collapse. This important fact does not seem to have been given authentic consideration, for the new structure has a width of only 88 feet, or one-tracted by the proposed length of gans of 1,786 feet, as against one-fouriesnth in the Forth Bridge as against one-fouriesnth in the Forth Bridge.

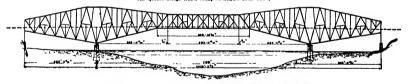
as against one-four-tenth in the FOTE Bridge,
it may be claimed that superious with American
it may be claimed that superious with American
proportion of 1 to 20 to be sufficient, but it is a question how far their immunity from disaster during
erection was due to the fortunate circumstance that no
strong winds were experienced—such as frequently
occur at the Forth Bridge, and may occur at question—which would have twisted its trusses out of shaps
before they had been connected up. Morovers, we berelated to the continuate over which trains
artituded bridge on this continuate over which trains



One-half of the cantilever bridge, Firth of Forth, Scotland; completed 1890.



The Quebec bridge which collapsed August 20th 1907,



The analysity structure now proposed by the Canadian government for the Quebec bridge.

THE DESIGN FOR THE NEW QUEEZO BRIDGE

management of the work was so badly organized, that the blasm could not be definitely fixed in any one quarter, and in the end the Causaldan government had to any one of the country flow. The work was even to be a comparable of the country flow of the country flow to the country flow. The work was even cluded to result the structure. For this purpose a commission of three engineers was appointed, and it was publishy amonumed that the new bridge would be the finest and strongest structure of the kind ever seen.

The Commission was appointed about eighteen months ago in the intertin the preparation of the plane has cost about \$130,000, and as the result of its eighteen months work the Commission has produced the very commongate educin, how-with Hitsdrated, re, sarding which there is a general professional opinion that boils structurally and esthetically it is distinctly interior to the Forth Intelige, which was completed nearly livenily years ago

nearti (well) years ago
If the bridge is built according to the proposed
plans, it will not only be of inferior merit, considered
from the bridge on enterer a standpoint, but will also
be lie ugilest bridge of monumental proportions among
these hilberto proposed or hult. It greeces the supersoner of a monotonous mesh of triangles and
not one crawful line in the whole structures, not the
not one crawful line in the whole structures, not

superation bridge could be built more cheaply, more quiskly and with lose risk of failure during revetton On the other hand, it a bridge of the cantilever type is selected, it should be one of the first duties of the Board to see that one of the contributory causes to the wakeness of the bridge that failed, namely, its desired, the selection of the bridge that failed, namely, its didner that the selection of the bridge that failed, namely, its didner that the selection of width, but they have activally central ted for the new stone plors upon this restricted basis, and it is a fact that the width is much as would put a serious Hmit upon any bridge engineer who attempted to design ofther a cantilever or suspension bridge with the necessary cross-sectional width to give he bridge that the cantilever or suspension bridge with the necessary cross-sectional width to give the proper ricitivity during evention, and subsequently the proper principity during evention, and subsequently of the proper principity during events, and subsequently the proper principity during events, and were familiar with his cautions methods, will agree that, could be have been consulted, it is more than probable that he would have disapproved of the present design, as he would have disapproved of the present design, as he would save of the owner is 105 feet on a sam of 1.100 feet which given a ratio of 10 to 1. This large width a time of the present design as a probable that the green which given a ratio of 10 to 1. This large width a direct a rigidity of the softire structure under wind direct a rigidity of the softire structure under wind even and the proper section of th

dare run faster than 25 miles an, hour The vibrations, due to the narrow width would become excesive, and at faster speeds would create danger of derillment. On the band, the advantages of great width in proportion to length are shown by the fact that the fast and heavy express teams in the north that the fast and heavy express teams in the shorth and the state of the state of the state of the short over the Forth Ridges their call speed of from 50 to 40 miles an hour

of sectional less continuous taw van instance.

over the Port herings at their rull speed of from 10 10 60 miles and hour to the specifications upon which are invited which is pussing engineers and contractors is that the maximum height of the tewers has been limited to 1900 feet above the manonry. It really would soom as though the board of engineers he deree not be appeared to the terms of the terms of the terms of the position of the posit

WILY PATRICTED DEVENTIONS. . . .

of fineress to Farmers,
CATLES-FAGITION — M. MUSTER, Gund CATLES-FAGITION — M. MUSTER, Gund Garante, Mhm. This improvement allows the most present produce on terrowness, and on possibility of freeing herroif from it, as the hook like you on the first which hole the stanchlotten of the same time the investor provides for beauty shinking the host at the same time the investor provides for beauty shinking the host at the onds to the upright red so it can swing freely about the root villators incoming detached.

ned without becoming detailed.

Of General Intercent.

CLATE.—If R. Crauses, Cedifice, Mich.

CLATE.—If R. Crauses, Cedifice, Mich.

Clate Common Cedifice, Mich.

Clate Common Cedifice, Mich.

and conver youts, each post constructed at sections arranged did by side and having abouting faces, with the open control of the reference of the common cedification cedificatio

treads are expected to be made of econe, crosses, or shallow masterial REMONATION IN N. 13. H. RUTH, NEW YORK, N. Y. This investigation to a device adapted to keep the plumper of an elevator intrinsic and the control of the control

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A HOVEL AMERICAN MONOPLANE.

(Continued from page 146)
culated through the bearings and the
crankshaft by a gwar-driven pump A
narrow Livingston radiator is mounted in narrow Livingston radiator is mounted in front of the motor, a short distance back of the center of the plane. Two torpedo-shaped gasoline tanks connect the two sets of front and rear nprights at the

consist of the machine.

The single surface of this monoplane consists of seven sections—a central one and three on each side. Both the spars forming the front edge and the rear spar, forming the front edge and the rear spar, in locate in advance of the ran-redge, are divided on such side of the center section into three-front lengths. These spars are jointed together by sheet steel spars are jointed together by sheet steel time and passing over the time posts is called at he junctions of the sections. The content at he junctions of the sections. The spars is sparsed to the section of the section sections. These or the section of the various sections. These or the section of the various sections. These or the are of the various sections. These ribs are trussed by an inverted rib and drill rod

formed of Baldwin's value silk-proof material, and which is colored black according to the fancy of Mr. places according to the many or an Pitturer; is laced on in sections and is held to the ribs by feather bone and tacks. A section 30 inches long is left out at each and of the plane. This sec-tion is to be occupied by the sliding wing tip These wing tips or equalisers, which are 30 inches wide by 5 feet deep which are 30 inches wide ny a see usey, have the same curvature as the main sur-face, and are each formed of three ribs connecting a front and rear edge, which slide in a suitable track made of steel side in a sintable trace made or stead tube rails extending the whole length of the outer section of each wing, i. e., 5 feet, and allowing the stiding tip a 30-inch and allowing the sitting tip a 30-their trivel. In their neutral pointion these wings the extend 15 inches beyond the wings the extend 15 inches beyond the flow the first of the control of the control you are the end of the wing, the other is found in the end of the wing, the other is drawn in homest the end of the opposite wing. These tips are connected by a long cable, which passes over pulleys and is wound around the control wheel, so that when the wheel is turned to the right the left wing ip is fully extended, and the left wing ip is fully extended, and the left wing ip is fully extended. The end is 12% square feet, when one it fully out-ineded and the other withdrawn, there is a difference in lift at the and of the wings of about 50 pounds at 46 miles and the opposite of the square foot. The horiestantly under in front and the travel. In their neutral position these

The horizontal rudder in front and the

The horizontal rudder in front and the tail at the rear are mounted on two trussed rods extending about 14 feet in front of and 10 feet behind the main plane. The horizontal rudder consists of a main beam about a third of the way from the front to the rear edge, upon which the ribs are mounted. These ribs are connected together by a light front are connected together by a light front. edge of wood and at the rear by a wire cable. The rudder is balanced. At its right end is a double vertical lover, which is connected by wires to a similar lever on the transverse shaft at the base of the on the transverse shaft at the base of the control column. The latter lever can be seen in the three-quarter front view of the machine. A forward and backward movement of the control wheel depresses or raises the horisontal rudder. The ver then rudder is connected to the control wheel in such a way that when the wheel is rotated about its vertical axis the rud der is set to turn the monoplane. The motion is the same as that used in steer ing a bleycle. The vertical shaft of the ing in the supporting bracket, the transbearing Cables connect the ends of this lever to a similar one on the vertical rud der In order that the length of th der In order that the longth of these cables may remain the same during the foreandaft movement of the control wheel, the bracket at the base of the con trol column is arched so that the anda of the steering lever just mentioned are in the center line of motion. The cable that constraint the wine ting, and which is on the according sever just mentioned are to the more than the control of the con the future, as we understand it is the inventor's intention to give it to the p

wenters intention to give it to the public and not to patent it.

All the woodwork used in the construction of this monoplane is of sprues. The sprurs and strate are solid and have their front and rear edges tapered, while the rear the are laminated with the exception of the motor, redistor, and gives cables, the whole machine is finished thick and (Considered on page 442.)





Aeroplanes 🔤 Motors

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(Foncluded from page 150) akes a very striking appearance makes a very striking appearance. In Pitture has already made a number of short flights in which the was able to set off the anoes-wered ground whith a classifier of about ton toes. The machine cellular stability. On one coation it whirled completely around who a the ver-tical radder was turned too shortly and yet in deing this it is done in the coa-tenance of the coation of the coation of the was not distanced. The renating our in-sease of the coation of the coation of the composite of the coation of the coation of composite of the coation of the coation of the composite of the coation of the coation of the composite of the coation of the coation of the composite of the coation of the coation of the composite of the coation of

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made however can their true value b

SHORELESS POWDER

CONTINUE FOWDER (Continued from page 15) dry in some ways—the cotton being di graited in centrifugal wringers of a sort akin in these in which indices are wash ed. The atmosphere is intensity as rid and the stranger coughs in the bitting air, to which the throats of the operatives were to be indiffuse.

seem to be indifferent. When the cotton has soaked sufficiently, it shows signs of heating by cuitting a dense brownish smoke I is then inuited into rais of running water, and there, drowned before la lug a rung out in mother mechani cal wringer The cotton, before inne-cent has become an explosive in fact, is A Complete Electrical quent stability and value as a propellant quant stability and value as a propellant now depend upon the thoroughness with alich all l'acce of the transforming acid and a strained from the "pyro," as it is commonly called To this end, the "pyro' is next put into open these loaded upon a flat car, and carried to steaming lanks, where for

two days it is builted and bolled to extract two days it is isolited and bolled to extract the major part of the clinging sets! We know we are dealing now with an ex-idealise by the sharp reports that come from under the car wheels as they pass Executely sleeplined the beaution. The Ministribute of the Companies of th anon our small his or literated cotton Next the streed cotton is taken to the pulping house, where it is pulped and noached like the materials used in paper nonched like the materian useu in page-making. The water is changed often, and after twenty or thirty hours work-ing, the "nyre is quite freed of the last trace of all. These valuous operation, do not undo the nitrating. The chemido not undo the nitrating The chemi cal instamorphosus accomplished in the cotion by the acid is permanent, and the boiling and washings serve only to re-move spent and unabsorbed acid. The willing pulp is now put through a "wet machine" coming from the rollers in sumy punt is now put through a war-machine" coming from the rollers in flakes containing about 40 per cent of noisture. Thence it goes to the debyd rating home, where all int a sumil per centage of the mulsture is extracted by ceulage of the midslare is extrated by successive significations of pressure and, finally, by the use of sheahol white drives the dampness before II leading just enough of the spirits beliefd to form the needful solvent when extree is added The ether is poured in and the stuff is ground and mixed in a nuclanical kneader. After half an hour's working the material neembles damp tracker crumbs Chemically the joyn is now solvent and has underson mucher change, requiring only its proper amount of pressure to produce homogeneity. The into takes weighing fifty pounds, which suggest soft rubber and are dully reson

ant The stuff is no longer white ant the sum is no nunger water and looks like syrupy maple sugar. The amber-colored cakes are then subjected to a heavy pressure and the plastic sum forced through steel collanders, whence It issues in cords like solid macaroni Again, for the sake of more perfect union these cords are pressed into a single com pact cake, and then the plastic mass is (Continued on page 152)









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(Continued from page 181.) and within the cylinder of the p

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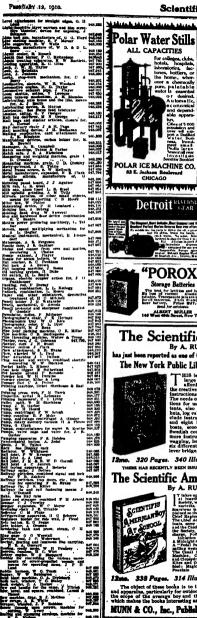
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days.

The plane of the orbit of Uranua is in the days.

The plane of the orbit of Uranua is in the day to the ecliptic, which is less than that of any of the other plants. The mean velocity of the other plants. The man who the first is 42 miles per second at a mean distance of 1,7819 million miles. The center of the orbit is 826 million miles from the sun. The plant completes its revolution in 84 02 years, and its position is shown at intervals of 120 days. Neptures orbit. is inclined at an angle of 18 deg withstanding the planet's great distance the linear eccentricity is only twenty five million miles The orbit velocity is 3.4 miles of the orbit velocity is 3.4 miles per second, and the mean distance is 2.7816 million miles The revolution is accomplished in 164.78 years, and the planet's position is shown at intervals of 180 days.

Neptunes distance from the sun is a very little over thirty times that of the

Parth (2791 6 829 -= 30 055 1929
root of the tube of this number gives the
period, which is 164.78 years. This illus-trates Keplers third law, vir. The
squares of the periods of the planets are proportional to the cubes of their mean distances from the sun. By similar comdistances from the sun. By similar com-putations the relations between the peri ods and mean distances of all the planets may be shown to be those which are hore

HOW TO DETFEMENT THE MURNING AND

A planet whose orbit is within the earth's orbit is morning star between inferior and superior conjunctions evening star between superior and ferior conjunctions. Prior to conjunction a planet outside the carth's orbit is even ing star, after conjunction it is morning star It should be noted however that when a pianet is near conjunction, it is not far enough away from the snn for observation. The iongest arrows indicate the directions in which the major planets are seen at opposition, the shortest ar rows the directions in which the would be seen at conjunction if the sun were out of the way At the date of opposition a night, and is therefore both morning and

If the page be turned about one-quar If the page be turned about one-quarter of the way around so that the earth in Hot I on January 8th (the date of the apposition of Neptune) be between the reader and the sun the positions of all the terrostriat plane's on this day may be seen without turning the head. The be seen without turning the head. The earth rolates in the direction of the ar row At sunrise an observer energys from the shadow area at somether the ters it. All planets which in the plot are on the right rise before the sun and are morning stars, those on the left set after the sun, and are ovening stars On Janu ary 8th Neptune is above the horizon before and after midnight, and is both morning and avening star Conjunction of Uranus with the sun occurs on the 11th Previous to this date Uranus Is evening star, and subsequently morning star On January 7th Saturn is at quad

rature, and is evening star. On January 4th Jupiter is at quadrature, and is morn-ing star. On January 17th Mars is at quadrature, and is evening star On January 25th Mercury reaches inferior conjunction Before conjunction the planet is evening star and after conjunc planet is evening star and after conjunc-tion it is morning star. During the month of January Yeaus is evening star The planet is at inferior conjunction on February 12th, and after this date is morning star.

The table gives the dates of conjunc-(Concluded on page 154)

Classified Advertisements

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innumerable papers of which over 17 G If there is any arientife, mechanical, or en-gineering subject on which special information is desired some papers will be found in this catalogue in which it is fully discussed by comprehen authority

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THE CONSTRUCTION OF DEST INTERRUPTER. Clear actual dimensions are mable

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of a conjunction or opposition ascertained by this means. It noted that these dates are usus where between these which are the plot and between Greenwich one day and the next.

	TARL		- '
	Green wich	Time.	
	Opposition	Conju	metion
Neptune .	Jan 8.58	Jul.	11 79
Uranus .	Jul. 16.17	Jan.	11 71
Saturn .	Oct. 26.87	Apr	16.63
Jupiter	Mar 30 75	Oct.	18.71
Mars .		Sept	27.21
Venus ,		Feb.	12.00 (inf.)
Venus .		Nov	26 04 (sup.)
Mercury .	********	Jan,	25.87 (Inf.)
Mercury .		May	25 21 (inf.)
Mercury .		Sept.	25.83 (inf)
		Apr	5 46 (sup.)
Mercury .	*****	Jul	19 17 (eup.)
Mercury .		Nov	12 08 (sup.)

THE DESIGN FOR THE NEW QUEEZE BRIDGE.

REIDGE,
(Concluded from page 148)
low height of 290 feet necessarily increases the weight of a cantilever, and if
used for the towers of a suspension bridge would result in a flat catenary, requiring would result in a flat extensive cables and unusually heavy and expensive cables and anchorages. The great height of the tow-ers and trusses in the Forth Bridge has an important bearing upon its rigidity under fast trains

an important bearing spon its rigidity under fast train in the fact of low height and parrow within in relating the weights is shown in the fact that the amount of steel to be put into the Quebec Bridge in a length of 2.600 feet is estimated at over 6.00 feet in out and of the fact of 1.000 feet is estimated at over 6.000 feet in the profit his continuous of steel in the 55,000 tons in other words, the narrow Quebec structure would require the enormous average amount of 24 tons of acts (about half of which morrower is nickel steel) per lineal foot, whereas the wide and rigid by both Bridge routired aff average of only 10 tons of carbon steel per lineal foot. It is true that the train por lines fool It is true that the train loads assumed for the Queber Bridge are about three times as heavy, but it is well understood that the weight of steel in any bridge of great span does not increase in anything like the same proportion as the live load

NEW OVERHEAD ELECTRICAL CONSTRUC-

TION ON THE NEW HAVEN PAILEOAD.

(Continued from page 140)

building, through the Westinghouse Company, an experimental freight locomotive, preparatory to operating its whole serv ice, freight and passenger, from New ice, freight and passenger, from New York to New Haren, a distance of be tween seventy and eighty miles, entirely by electric power

y electric power

At the time of its construction the present twenty three miles of electrified line between Woodlawn and Giendale. lino between Woodlawn and Glendale, was one of the most courageous and coatty experimental works of the most courageous and coatty experimental works ever understaken in the breast field of electricity. The story of the company and to control in which the company and to control in which the company and to control in operation one of the businest four-track rational and the same time keveling in operation one of the businest four-track rational and the control of the business four-tracks ratio world, has been told from time to time and in considerable detail. in these columns. Today the security of a some is running with the regularity of a watch, as may be judged from the fact that the delays through breakdown of the electrical locomotives are shown by the statistics of operation to be 100 per out less than were the delays under speet. ation by steam locomotives.

two or three years has revealed to the engineers some features in which the elec-tric plant is capable of improvement. Pur-tioularly is this true of the everhead (Concluded on pure 186.)

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of the matter in this book has never before ablabed, as, for instance the vacuum dryin programing processes, the making of adjust, and a supplementation of the processes of the program of the processes of the p

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(Concluded from sage 151) work, which in the existing line is massive and decidedly costly type of con atturtion In addition to its expensive nature, the present overhead line was found to have unnecessary rigidity, and it was decided that before extending the work to New Haven it would be wise to ulid a fullo of experimental line, odying the improvements auggested by pant experience. We present two photo graphs and a diagram which clearly lills irate the character of the new work in the old construction the line is carried upon massive atcel bridges, spaced 100 upon massive atest bridges, spaced too feet apart, each bridge consisting of a pair of columns supporting a lattice trans which spans the four tracks. Each trol ley wire is hung from a pair of siefe 'incasenger' cables by means of a series of triangles, the messengers being hung in a true catonary and fastened to insula tors attached to the top of the lattices The trolky wire, which is main trusses. The trolley wire, which is main low the supporting trusses. The whole of this system—messenger cables, tri angles, and troiley wires—is charged with urrent at the high potential of 1190

was made not only to lighten lise on struction, but also to provide one whose anywarance would be lighter and more gractifit. Furthermore, the calies und wring have been so arranged that the main carrying eshies and the main plee haugoes are not charged, and the only live portion of the work is the catemary ly reference to the engravings it will be seen that the place of the manufact ridges is taken by a pair of relatively stender tapering, columns, which are curved inwardly until they terminal above the centers of the outside tracks. To

was made not only to lighten the con

hold the columns in a vertical position and prevent their sagging under the load of prevent their sagging unter the total of the cables a length of steel pipe trinsed with wire, is introduced between the posite in a tring ends of the columns 'the duty of carrying the wiring fulls upon two 1', inch steel wire endses which are secured at the onds of the latticed columus, and extend continuously through 1) pending from out the whole line out the whole line is prisoned to these cables at intervals of 190 feet are a series of main pipe hangers each of series of main pipe hangers each of which consists of a horizontal limb pipe which is being from the califes above by which is hung from the califes above by two pairs of supports formed of 1½ in he pipe. All of this construction those for described, columns, main cables and name pipe hangers, he at all times dead none of the current being allowed at any time to pass through H—a future of the greated importance when it comes to the greated Importance when it comes to the question of studing uptice requires to the line, or of adjusting the set of the cation of the content ported therefrom by steel clips, is the of which the collector shoes of the locomo-tives bear with an upward pressure of about 25 pounds. The method of attachabout 20 pounds. The method of state-ing the contact wire to the trolley wire at points intermediate with the points at which the trolley wire is itself enapended, provides a system of equalization which gives to the system an even flexibility throughout its whole length, and insures a continuous contact and a consequent

freedom from sparking
The management of the electrical sone of the New Haven Ratiroud Company and of the New Haven Khilingan Company and its ongineers are to be congratulated in having made such a marked improve-ment, both from the constructive and asthetic standpoints, over the existing line between Stamford and New York



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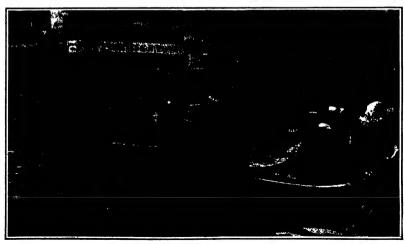


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NEW YORK SATURDAY PERRUARY 19th, 1910

The follows is aways: last in receive for examination libertured arise a subnetice of timely follows: If the photographic are shart, the series and the hole surfacility in Contributions will receive specialists. Accepted arthics will be just for a regular space raise:

SECRETARY MEYER'S PLAN FOR THE RECREANIZATION OF THE NAVY

THAT one of the first acts of Mr Meyer on usseming the extremely difficult ond respon sible position of Becretary of the Navy, would be to make a thorough investigation of con-ditions with a view to placing that very complicated orthing with a vew to justing that very completeners also a new label as severable must have foreseen which familiar with the excellent work of reorganization which he nehrved while helding the position of Post most, will never

a changes introduced by Mr Mever ore nece sarily supplemental to the work of his predecessor Newberry who had formulated and put into effect a system of consolidation whilele, in the brief period a system of consolidation while, in the brief period of its uperation bed shoon excellent results Mr. Mevr has assured us that the chonges which he has instituted in the Newberry plan have been made not for the purpose of reversing but rether of amplifying the work of consolidation inaugurated by his prede The essential changes involved in Mr

Cessor The essential thatages involved in Mr Meyer a "pish are summarized under the following heads (1) The pruvialoo of four responsible advisers to the Secretary) un subjects within the groups intu which dulies of the Pepariment inglishly full 12) The grouping of the Dureaus into two divisious

of material and personnel according to the unince of

(3) The establishment of a Division of Operations

(4) The establishment of a comprehensive inspe-Hou system of a permane at organization whose offers shall be periodically thanged who will come mainly from the active flot and be conversant with the latest ips and the modern methods of drill and orgo

(6) The catabilishment of a modero and efficient coat keeping system in the Navy Department and of

navy yarda. e separation of navy pard work into the two

natural divisions of hull and mischinery
(7) He intends to require that commandants and
ciptains of jurisd for many varia shall be selected for
their knowledge and experience and that their tonuer
of office shall be lour enough to Insure continuous

administrative policy The Separate Augustan has before it the printed record of the hearing of the Secretary and various an cidefa before the House Vaval Committee as pointed to consider the proposed reorganization, and, after giving the same a most enreful reading, we have come to the conclusion that with one very serious exception, the measure proposed by Secretary Meyer ar well adopted to promote that consultation which Mr Naherry began and which the present Secretary 14 endeavoring to place upon a lasting workable basis.
The appointment of four aides, independent of the whose duties will be to inform and advise the Burelary on metiers coming noder the four g erol heads is an excellent arrangement the need for which had been keenly felt by previous secretaries. The Aldes for Operations of the Fleet, for Personnel and for inspections are to be line officers. The ques-tion as to whether the Aide for Material should be chosen from the line or staff is left open. We are decidedly of the opinion that in seeking for advice on the question of material that is ships, engines navy the question of material that is stype, engineer may rards at the Screeney should have as his adds the Chief or some high tanking Naval Constructor, who by training and experience he best qualified to advise upon these subjects. A proportion of three itos officers to one staff officer among the aides would give a fair representation of both branches of the service, and would nut the Secretary administry in touch with the

whole range of active work in his Departs whole range of active work in his Department.

The feature of Secretary Meyers plan which we consider to be upon to very grave question is the proposal to securate the navy yard work into two divisions. post to searrate the nery yeard work into two divisions of built on machinery, with a separate and independent manager for each for the change involves the étieut of one important object of the Newberry plan as affecting the neary years, namely the securing of efficiency, and the avoidance of confusion and delay, the marry, and the abole of the work offering the con-struction of the ship in charge of the afficers of a single corps with a member of that corps as general works manager of the yard. Mr Meyer recognizes that a navy yard is a military establishment and musi be under odditary government but this condition was not under the Newberry plan by placing at the head and under the Newberry plan by pine tog at the seaso of the yard a commundant who is always a line officer of high rank. Under him came the manager, a naval constructor whose executive powers were recognized me covering not the military, but the industrial side of the work. In view of this distinction, we fail to of the work. In view of this distinction, we find the see how the management of the yard as to fits non-rillitary and purely industrial features by a staff officer of the naval construction corps is, in any pos-sible sense a total in or of that law of Congress, ac-cording to which a staff officer cannot exercise unit lary command over any other than members of his Under the former ireagoing) officers of the Engineering Corps, who acre temporarily assigned to the steam engineer ing department at the navy yard were subject to the

und not in the military senso If it is advisable fur economy and efficiency and the consensus of evidence is overwhelming on this point, that the navy yards should be under a cingle indus manogonient and that this manogement should rest in the naval construction corps, and if under such an arrangement any legal question is involved as to the right of the constructor-manager to exercise non who may be temporarily assigned to duty at the yard then the somer the law is modified the better for the interests of the navy, and of the American people as

al constructor monager, purely lu the industrial

If it be asked why both hull and mochinery abouid be placed under the control of a single head, and that lead the naval constructor we reply that the bull and the mochiners are merely subdivisions of one organic t buk and that the two are an greatly interdope as to make it makessary that their design, constru and anissequent repair be under the management of a single curps, who are qualified for the work by train-ing, knowledge and practical experience. Now, we veniure the statement without any fear of successful contradiction, that the ma body of men who combine the necessary knowledge of navni architecture and steam and electrical engineering to qualify them for the oversight of the construction and repair both of the built and the machinery is the corps of naval con structors. Unfortunately, much of the evidence which is been given before the committee has been directed to proving that the naval constructor is ignorant of in and electrical engineering and therefore not lifted to take charge of the shops devoted to these branches at the novy yards. That nothing is further from the truth is shown by the following consideration of their training and experience

In the first place the naval constru of the Saral Academy graduates. They are selected from the highest numbers in their class ond, as a rule have been taken from the first two or three. In making the selection in addition to their academic standing careful consideration is made of their gen ral optifude for the service as shown during their and optitude for the service as shown during their there or faur years at sen, of their general officer like qualities, and of their aptitude for the handling of men, and for governel administration. The principle of selection is the same as is followed in the case of that other highly specialised and most efficient body of professional men, the corps of engineers of the same Africa of their education as line cliebres at sea same). After their education as line cliebres at sea ronstructors are given at the famous Mass Institute of Technology a post-graduate course in naval construction, which is the most thorough of any in

Furthermore (and we cannot too strongly insist that opression that the naval constructor is the unpression that the navia constructor is not a quali fit d siam engineer is abouturly eronocoust the course at the Massarhusetts Institute of Technology involves also thorough instruction in steam and electrical engineering during which the prospective constru-tors are given a course of practical training in the

rachine shops and inhoratories of the institution.
The life work of the naval constructor will be d on shore and mainly at the various navy yards, and on suore and mainty at the various mavy parts, and by virtue of his long residence at these yards, or as inspector at the various private shipbuilding yards, he kathers an over-increasing and immehaely valuable knowledge of the operation of these great industrial pronts: Future promotion and distinction for him lie dge of the very intention for him to Future promotion and distinction for him to these lines. There is every incentive for him to along these lines. There become thoroughly profit

Withighe line officer, however, into whose ha Meyer's plan would commit the construction of all electrical and steam machinery, and the management of the large and elaborate plants at the navy yards where this work is done, the case is entirely different.

After his four years course at Annapolis, the prosjective naval engineer goes to sea with the expectation of spending practically all of his time affects, a saturally, his sympathies, interests, and above all ambitions, will be connected with sea duty. As as signment for service ashore is merely a break in the signment for service assore is merely a press in the routine of his chosen life work. If the line officer be an engineer officer, he will calarge at sea his knowledge of the care and operation of a ship s machinery, but since by far the greater part of his timo is spent affort, his opportunities for becoming acquainted with the complicated and difficult work of managing such large industrial concerns as the steam machinery shops of the navy yards are, in the nature of things, very limttrd His work is to run not to build, the engines. just as it is the work of the captain of the ship and not to build the hull.

on when the line officer is ashore, his interests Even when the line officer is ashore, his interests and future sims are still upon the sea, and, as a rule, he is only too glad when the next assignment for sea, they comes. Proof of this is found in the fact that during the past six years there have been at our seven the leading navel yards, no less that 22 commandants and 41 capitains of the yard Evidently, the see-going officer connot too quickly get back to his natural sphere of

If there were available at the proof engineering officers who, like the navel constructors, had been specially trained for above duty in the man-agement of the machinory shops, etc. at the navy yards we would have more hope of the success of this particular part of Mr Meyer's plan, but outside of a few of the older engineers, trained under the system obtained before amaigamotion an each body of men is available Furthermore, it is our conviction were such a body existent it would still for economy and efficiency, if both full and machins placed under the single management of a naval countructor

That part of the Newberry plan which affected the That part of the Newberry plan which affected the any yards was string very promision results at the state way read was string very promision results at the time Me Mayer took office. We have little doubt that his determination to separate hull and unchange was proverned largely by certain alleged leatance of the capacity of the near constructors in taker manual of the mark the shops which were supplied to the Secretary, most of them over the signalure of the Euglineer in Chief. The testimusy before the Heauthorn in Chief. The testimusy before the Heauthorn in Chief. The testimusy before the Heauthorn in Chief. Natal Committee now before us however shows that a subsequent examination of these reported cases has elicited from the commandants of the various yards (all clietted from the commandants of the warfous yards (all) of them line officers] a complet disproval of the charges as made —a very gratifying vindication of the work of the unait constructs in this particular regard. We examel but feel that with this later evidence before the west of the Secretary will be disposed to reconsider that part of his otherwise exection reforms, which proposes to separate bull and machinary and that he will allow the Newberry plan of a single man-agement amfelent time to further demonstrate the conomy and all round efficiency of which it gave in the few months of its operation such great pro-

ELECTROLYTIC REMOVAL OF GREASE.

N electrolytic method of removing gream from objects has been introduced in Germany opects has been introduced in Germany of the Common only a rapidly removed from metallic objects by employing it on a cathods in a hot solution of potash or soda by a live was supposed that the alkali metals set free or the cathode transformed the fatty matter into some, but Barth has now shown that substances which cannot be saponified. such as machine oil, paraffine oil and paraffine, are removed very quickly by the current, and he explains removed very quickly by the current, and he explains this fact by mechanical action caused by hubbles of hydrogon which come of at the exhibit This action is produced only when the fatty matter is liquid if the temperature of the bath is too low so that the arrage is consistent, the removal is very size and incomplete He operation with a moderately concent ratted solution of exhonate of potath heated between 88 and 100 deg C at the anode he uses sheet iron the contract of t trated solution of exposure or services and services of the se

To permit two steamers to pass from the Wisconaria River to the Mississippi River, near Prairie du China River to the Mississippi River, near Prairie du China, a millium pridage on the Chicago, Buritagaton, and Quinor Railway was raised by breakfows creases as few works ago There is no newigation on the Wisconaina River, but the two steamers were sent down to ester service on another route. The railway creases the river near its mooth, and a 65-root span was related about 6 rest to olser the studency function.

Scientific American

ENGINEERING

George W. Melville, Engineer in Chief of the United States Navy, states that there is every reason to be-lieve that two ships of the navy will be fitted with the invotes that two samps of the many min on titled with the front page of our last issue. It is proposed to re-ongine the "Battimore" with turbines of 13,800 horse-power and equip one of the new colliers with turbines of 5,600 horse-power, both employing his reduction gear.

The number of persons killed in train accidents dur ing the months of July, August, and September, 1909, as shown in reports made by the rallroad companies to the Interstate Commerce Commission, was 193, and of injured, 3,752 Accidents of other kinds including those sustained by employees while at work and b meers in getting on or off the cars, ale the total number of casualties on to 20 093 (852 killed and 19 241 injured)

The Shoshone dam in Wyoming, which forms the kading feature of one of the projects of the Rociama tion Service, has recently been completed it is built of concrute, and measures 328 4 feet from foundation to the creat it is 175 feet long at the top and 85 to the cress It is 176 feet long at the top and 85 feet long at the bottom, whore its thickness is 108 feet. The reservoir back of the dam, which has a capacity of 455,000 acre feet, will serve to irrigate 139,000 acres of land situated about 75 miles seat of the Yellowstone National Park

The grand total of canal excavation at Panama for the month of December was 2,811 681 cubic yards This is 362,366 cubic yards more than the total for November, but 1,068 656 cubic yards less than the November, but Joss 866 cubic yards less than the highest record made in March 1809 Of the grand total, 1,485,611 cubic yards was dry excavation, removed principally by sleam shovels. The dredges removed 1,366 970 cubic yards in addition to the amount umped into Gatun dans by the suction dredges en gazed on that work

In recognition of the culmination of his life work in the discovery of the North Pole, the Senate has passed a bill making Commander Robert E Peary a rear admiral on the retired list. This algust recognition of the explorer followed closely upon the recent bering presided over by the (lovornor of the gathering presided over by the thoromor or the cause of New York at whit b Peary received a gift of \$10 doll which, by the way, he immediately contributed to the proposed American expedition for the discovery of the South Pole

Motor Mason M. Patrick of the United States army speaking on the subject of the construction of an artificial island and additional fortifications near the en trance to Chesspeake Bay, drow attention to the fact that the two largest and featest merchani vessels afoat to-day could each (arry 10 000 men with all their mu DE UT WAT, AT d if imopposed, could land them or cur coast lu less than one week and he also stated that more than one foreign power possesses a fleet of swift transports which can carry at one time over

Secretary Meyer has asked for a large appropriation the enlargement of the government drydocks i suit the huge battleships now under construction. He also asks for the construction of a \$2,000,000 drydock at Nordek, for an additional \$1,000,000 for increasing the new dock at the New York navy yard to a length of 700 feet, for an additional \$1 500 000 for increasing the Puget Sound dock to a width of 110 feet, and for the culargement of the width of the Pearl Harbor dock, Hawaii to the same width at an increased cost of

se new terminal station of the Pennsylvania Rail road Company at 33rd Street and Seventh Avenu Manhattan, is so far advanced that it will be pra-tically completed by the end of next month. The fir The first to be put in operation will consist of multiple unit, standard size, electric trains running to Jamaica Long Island, over a four-track road, which will soon be increased by the addition of two more tracks. This will be followed by the opening of the through express service to the West, which will be operated by the 4,000-horse-power electric locomotives illustrated in cur issue of December 18th, 1909

Were Jules Verne with us to-day, he would be greatly Were Jules Verne with us to-day, he would be greatly interested in two instances of rapid travel recorded during the past week. A traveler from London to San Francisco won a wager by overling the distance in two hours and thirty five minutes less than ton days, the trip being made by the "Mauretania" to New York, the 20th Century Limited to Chicago, and the Verstand Limited to San Francisco: A passenger from the Chicago and the Chicago. Lima, Peru, in making a hurried trip in response to a call to London, left Lima the same day by steamer to Panama, crossed by the Panama Railroad; made close Panama, crossed by the Panama Hailroad; made closs connections with a steamer for New York; and causing the "Mauretania" for England If the ship makes an average passage, the whole trip will have been cov-ered in 16 days.

AERONAUTICS.

The first exclusively aeronantic show to be held in America is open at present in Mechanics Building at Boston A score of full-sized representative neroplanes Hoston A score of ministed representative neroptanes of all types, tegether with a large number of models, are on view Several competitions for models will be held, and some of the gliders and motor-driven sero-planes may be tried out upon the lee of the lake in Franklin Field This exhibition will give one a good idea of the state of aeronauties in the United States

On the 10th festent Withur and Orville Wright were d with the Langley medals of the Smith institution by Chief Justice Fuller at Washington Dr institution by Chief Justice Fuller at Washington Dr Alexander add or Benator Henry Cabot Lodge made brief addresses Wilhur Wright an nounced that as soon as he and his brother get their rican company under way they expect to devote American company under way they expect to curvue their time to research wark in addition 1 he two gold medals were designed by J C Champiain a number of the French Academy, the reverse being from the seal of the institution, which was designed by St Gandens

Paulhan has expressed a willingness to fly in the icinity of New York if Curtiss or son exted person will have that injunition dissolved which exted person will have that injunition dissolved which in now hangs over the heads of avisions using warpable planes or hinged wing tips. His brilliant success in California leads one to hope that his desire may be gratified in the interests of a sport of which the United States in general and the East in particular knows lamentably little If Paulhan really gives an exhibi tion in these parts he will do much lo stimulate New Yorks interest in aviation The Hudson Fution flights tion in these parts he will do much lo stimulate Now Yorks interest in aviation The Hudson Futton flights were after all a flasse, and yet they ruused New York to an inituse pitch of excitement. Paulhan ought to

The first week of February the suit of th brothers against Paulian for an injunction restraining him from giving exhibitions in his barraine biplane was tried before Judge Hand in the United States Circuit Court in New York city Index Lind main tested great interest in the (ass. and his decision is swalted with interest. It is uncertain whether he will awaited with interest. It is uncertain whether he will grant a preliminary injunction as indee Hazel did at Buffain tast December. In defending the attack of the Wrights upon the Bieriot monopiane. Mr. E. R. Newell asserted that Pruf S S Montgomery's natent which aniedates the Wright patent, covers the same system of plane warding as the Wrights themselves chine and he further says that the muchine as built to-da does not correspond with the patent. A full report of the Wright-Curtiss case and the text of Judge Binzel's decision appears in the current Supersuper

As soon as he had finished liylug at Los Angeles, t'harles K Hamilton went tu San Diego where he made er of daring flights with his Curtiss biplu On January 21d, after starting from the vasi plain near the Hotel Del Coronado Hamilton twice liew uni over the ocean so far that be disappeared from view for ten minutes. When he re appeared he came from a different direction. In the first flight he covered about 10 miles, and in the second one 15. The wind was blowing at times as high as 20 miles an hour. After circling upward to a height of about 800 feet. Hamilton stopped bis motor and made a wonderful long straight stopped his motor and made a wonderful long straight glide to earth. This is probably a record performance, uly the longest gilde ever made in America. week later at linkersfield Col. he made two excellent flights under difficult conditions. Starting from a half mile track, he flew about the town and out over the ort and adjoining oil fields, finally lands fully at the starting point. His mastery of the biplane

Subsequent to the Los Angeles aviation meeting M authan made excellent exhibition flights at Sar Fauniano, Donver, and New Orleans at Han Fran-Francisco Donver, and New Orleans at Han Fran-cisco on January 24th he made several dights in a strong wind the last and highest of which of 12 minutes duration, was made after sunset. Two days later be rose to a height of 1,300 feet in a flight of later be rose to a height of 1,500 feet in a flight of a linuted furnishin On Fohrmary 1st, at livewer, he was mobbed by a crewd of 30,600 people cagor to see him fy After three prilitations; attempts, he finally left the ground and made two tircuits of the course of Overland Parts. The next day he made a lientife cross-country flight in a driving snow storm in starting, he sails he Forman believes through snow three hims, he was he Forman believes through snow three the properties of the prop sep, and when he alighted, the plane struts of the machine were in many places covered with snow, while Paulhan himself was suffering from the hitter cold Previous to this long flight, he made a nitter cost Previous to time long nigni, so mace a preliminary dight of 8 miles. On February 4th after circling the Park successfully a dozen times, Paulban twice was unsuccessful in starting in the distance at his disposal The first time one of the wheels of his his disposal The first time one of the wheels of his machine struck the fence and was knocked off while the second time the machine crashed into the fence and was demolished Paulian was nahurt, but several speciators were injured.

ACIENCE

The American Misseum of Natural History in Now York (ity has cumulestoned William Coupe to model a statue of Commander Robert E Peary for the Voscum Tite statue is to be life size and of numble

In a bulletin issued by the United States Department of Agriculture Mr Ned Dearborn writes on methods of destroying English sparrows. The exist one of the destructiveness of the sparrow is overwhelming, for which reason some means should be adopted to check whith reason some means should be adopted in these kine stread of the bird. Mr. Dearthour recommends the destruction of the nests from two in twelve days throughout the breeding season. Thus the number of English sparrows could be reduced without resorting to shal noison or trans-

The Smithsonian Institution has received a letter from ex Pradicut Russevett dated December 15th 1909 from Natrobi Informing the secretary of that Institution that his expedition has holsbed its work tu Brilish East Africe. The collections made in that country aggregate 8 463 nulmats which belond; main nais targe and small, birds, toptiles and batrachians fresh water and marine fish Considering line fact that probably over 95 per cent of these aulmais find their duplicates in the natural history missoums of this comiry and of Europe ex President Roosevelt seems to have been doing much unnecessary killing

The Radium Institute of America has been inc parattel lis purposes are to study radium and radio active substances rays, and cuanations in the inter ests of science and humanity and tu maintain a chemi cal laboratory library, meeting room and offices and to acouste and hold realents and licenses to deal in radium and properites pertaining to radium bradguariers of the institute will be located in introdunties of the institute with de leasted in New York The twive interpretations are Dr. Reibert Abby, Dr. Nicholas Murry Butler, Charles F. Chandler. Ber pen Davis, William J. Givs, William Hallock, Ellwood tlendfrick Hugo Heber Dr. Willy Meyer. George B. Pegram, Jingo Belweitzer, and Edgar F. Snith of the I niversity of Pennsylvania

An expedition to observe and photograph Halley s An expectation to convivo and intellegran justice's convet from the Hawalian Islands is to be sent out by the Astronomical and Astrophysical Society of America in view of the possible erritributions arising from the class approach of the cuntet to the earth on May led and to Vitus on May 16th to 18th queridian observations are especially desired during the period in which the current is sufficiently bright for that pur pose The close approach of the control to the earth Will afford an unusual approximity for a study of the physical condition of consta The counts a close prox-limity to the sun at the time of maximum brillancy inposes acrime limitations upon the Rockety a pro-grammum Widely extended cooperation will be re-quired firecuspion; the whole world if a continuous theorems over the table world if a continuous The close approach of the comet to the er

The American Museum of Natural History has been presented with a life-size marble statue of Morris K Jesup by 1 Pierpont Morgan, Henry Pairfield Osborn, City land It Dodge Charles Lanler J Hampdon Robb Joseph II Cheale, and others. At the unveiling of the statue addresses were delivered by Prof. Osborn I who succeeded Mr less p as president of the Museum) Mayor Gayner and Joseph 11 Choate

Commandar Robert B Peary has contributed \$10 000 to a fond for the equipping of an American expedition to the South Pole. The check for the amount of his contribution laid been landed to him by Gav Hughes contribution to the nation of the him by Gav Hughes on bolaff of the people of New York as a testimontal of appreciation of his achievement in fluiding the North Pule, and the Metropolitan Opera House was crowded with people who had come to take part he wind the tering Clyk Forum called n antional testimonial to the explorer

There is a gascous thoseof discovered in the simos phere by Raissay which is researchable for his chemical ineriress half though desitate of chemical properties merriass in though desirate of in intelligence in properties in the possess as a very curtures physical property white twee discovered by J. Norman Culli. When a scaled glassible containing mercury in an atmosphere of ocean allow pressure is staken il becomes strongly fund. nous Similar effects are obtained who other succession are substituted for neon but the light emitted by neon in these conditions is especially bright of the shaking is repeated at totervals during two or three hours, the intensity of the tight discloshes for a time and thereafter remains constant. The original lumi osity can be restored by passing an electric discharge through the tube. If one end of the tube is heated to 750 deg. F. while the other end is coded by immer sion in liquid air and the tube is then allowed to return to the ordinary atmospheric temperature part which has been heated glows much more brightly than before. The luminosity is also greatly in crossed by substituting a tube of fused quarte for the glass G Claude is endeavoring to utilize this remark able property of mean as a source of light and claims to have constructed mean lamps of an efficiency equal to about 1 watt per candle power.

DID GREAT BRITAIN HAVE THE FIRST "DREADNOUGHT"?

THE "ROYAL SOVEREIGN" OF 1862

BY PERCIVAL A. HISLAM

The SCIPMITTE AMERICAN for November 20th, 1809, contained a description by Mr William Boerons Watmars of the U S S Rounoke' a converted steam frigoric, which he claimed to have been the original Irigate, which he claimed to have been the original printity of the Drasdought. The date of the con-version of the Boanole, from the Frigate into the hierarchical to found was 1833 but Praginal, the hirthplace of the teachieth cuttury Drasdought, her a shulfar instance to the Konnoke, but which dates from the pixtons year—1862 The Boyal Solvenign as this ship was named, was

The Royal Sovereign as this saip was names, was abilit as a three-deviced sailing ship of 3,44 tons and 120 guns and in 1860 had been fitted with engines of 800 horse-power. The sides of the 'Royal Borersign' effer conversion were composed of three feet of solid strong bened internally with discousi iron nd clothed externally to some distance belo beauts and control externancy to some distance occur the waterline with 5°1 line rolled armor plates. One line iron plating was laid upon the deck beauts, and over the iron plating was laid the deck proper, cos-setting of 6-inch and 8 inch oak planking. From the elder of the ship the deck sloped upward to the outer circumference of the tarrets, which thus appeared like

circumference of the farrets, which this appeared like circular fortie on the apex of a glack.

The following description is taken from a contem-perary meannt in the London Times newspaper "Step-plus on the Royal Soveredge's upper deck, we find itus on the Royal Sovereign's upper deck, we find that her itshit iron buiwarks, 3 feet 6 inches in dopth are thrown down outward on hinged stanchions. On the creat of the deck stand the four turrets and pilot he use, funnel casing, hatchways, and ventilating shaft. The formost turret standing five feet above the deck, has its top covered by a grating, and is surrounded by a handrail, and thus affords a deck promonade for the other of the wath nr lookout man Fb alongiegun turrels are 4 feet 3 inches above the deck.

if was claimed at the lime that the method of munt-ing and working the guns in the "Royal Soversigu" was superior to anything which had then been applied in any American turret ship. In American design in any American turner support deck, and was thus liable to easy disablement, but in the English vessed the lease of the turnet was on the lower dock, and the cita del was there fore much less likely to be disabled by a hit. The American method resulted in the turnet being nine feet above the deck while in the "Royal Sovereign" only five feet nr four foct three inches, as the case might be, was exposed to the enemys fire. further, the latter ships turrets could be worked by rack and pinios inside the turret, by the same method from the outside, and hy handspikes worked like cap-

Iron to outside, and by manuspines would not expended as well as by steam

It will be seen that the "Royal Sovereign" had four turrets—one more than the Roanoks", but she had one gun less, for while the foremost contained two guns, the others had only one each All the turrets mounted on the center line of the ship, and the gans were muszle loaders of 12 % tons firing a 300-

e original spe d of the "Royal Sovereign" had b 19 25 knols, but after conversion this fell to 11, a difference which was fully accounted for by the in-creased immersion of three feet. Her freeboard re-



Converted British three-decker "Royal Savereira changed to an all-big-gun battleship in 1862 WAS THIS THE PIRST " DREADWONDET!

mained at seven feet after conversion. The cost of

mained at awan feet after conversion. The cost of the work was \$428,500.

The "Royal Bowr.edgn." besides having been, at any rate, one of the prototypes of the modern 'Pread nought,' is interesting as having been the first vessel actually built in Bagained semboring these principles was the "Captain." an ironeland of 4,772 tons, which capshed in the Actual Proton of the Captain and the Captain. The contract of 4,772 tons, which capshed in the Actual Proton of the Captain and the Captain and Ca

three, both ships had 5½ inches of side armor in a rolled plate although up till then most American ships

had been armored on the inferior laminated system, both ships were practically markless, for the three peles of the "Royal Sovereign" reached only just above the top of the funnel In freeboard there was little e between the two, while in the met placing the turrets the British ship was decidedly

Much, therefore, as we owe to America in the de muon, mersore, as we owe to america in the de-velopment of modern navies, and more especially, per-haps, in the introduction of steam navigation and in the correct placing of turrets in modern battleships, I think it must be admitted that Great Britain was, the first to possess a prototype of the modern "Drund

nought."

I have been unable to procure a picture of the
"Royal Sovereign" for reproduction, but the accompanying elevation and plan will convey an idea of the
appearance of the ship.
It may be mentioned that Russia launched in 1867

It may be mentioned that Russia laumched in 1875 the "Admiral Laurent," a three-turreted tronclad of 5,754 tons, very similar in general design to the "Romonke." Bhe carried in sach torret two 15½-ton guns, but it was seen fit later to alter this to one 11-inch for each in view of the diagonal (or echelon) arrangement adopted in the British "Dreadnought" cruisers of the 'Invincible" type, it is interesting also to note that Italy ied the way with this system of mounting with the "Duitio" (1876), Great Britain following with the "Infexible" in 1881, and with four other ships a few years later The only American examples of this system of mounting were seen in the "Maine" and Texas," the first with two 10-inch and the second

'Tona,' the dirt with two 194mh at the second with one 184mh pun I nech terred.

The arrangement of the turres is the British Dreashought, had a protrippe in the French "Admiral Druperts," is suched in 1879. This ship had two turreis on the center line and on the same level aft, and a invest on each beam just forward of the fun node. The sums had a freeboard of 17 feet 5 linehes, siving them a great command of fire Each turrei contained one gun of 133 linehes caliber, and if another center-line turret he added forward of the two beam turres, it will be seen that the arrangement of the strange how often we are confronted with the fact, in reading of 10 books and other records, that there is "nothing new under the sum".

WORLDS OTHER SPAC

BY PROF. S. A. MITCHELL, COLUMBIA UNIVERSITY have systems around them possibly resembling our

Lave systems around them possibly resembling our own solar system, and it in nn outside the bounds of probability that many of the planets about these distant same may be inhabited by people who live and mave and think indeed, this earth of ours, of so much importance to us, is a most insignificant speck in the almost limitiess universe.

If one should look at the heavens on any clear moon less evening, he would see them shialing with countless orbs of light apparently millions in number—It is a fact that from our earliest education we have regarded the terms "numborless as the asnds of the sembore," and "countless as the stars," synonymous with quanti ties almost infinite, but if by the stars we mean those

that can be seen by the naked eye and the expression thousands of years before the invention of the telescope), our ideas have been ulterly at variance with the truth The un aided eye cannot monly supposed, nor yet hundreds of thousands for at any one time as could count only two to three thousand separate stars, and in whole heavens there are less than six thensand which can be seen with out a telescope. A

The second second

PROTOGRAPHS OF THE SPECTRUM OF A ORIGINA, JANUARY SIA AND SIA, 1900.

The upper spectrum shows a velocity of \$5 miles not accord away from the careth, and the lower one of \$5 miles not an

number largely, and with greater and greater tele-ecopes more and more stars are brought to our ken it is estimated that the astronomer of to-day can see and photograph upward of a hundred million of stars. Each of these is a sun shining by its own light, the new astronomy tells us that thousands of these suns

omers by their meridian circles have been Astronomers by their meridian circles have been able to measure the exact positions of these distant so-called "fixed" stars, and have come to the conclu-sion that in spite of their names, there is none of them absolutely fixed in space, i e, without motions. The movements of these heavenly bodies at the smor-

mous distance we are from them are however very small, and the changes of position in the sky so slight from year to pare that they could not be found with the out the most careful measurements so from this point of view the stars are faxed, and the constaint does appear the same now as they did to the Chandean shepherds thousands of years ago SHII the could not are of the re-

none the less old astronomy was motions athwart the sky, at right angles to our line of vision, the new astronomy is able to supplement this by a knowledge of their movements toward up or away from us in the line of sight. The reve-lations of this new branch of astronemy are revolution-ary in their impor-tance, and of the greatest moment to our ideas of the universe as

hole The principles underlying the use of the modern spec-trescope applied to

in Scientific Architect, December 18th, 1906. There is required for this purpose a powerful telescope, and a most accurate spectroscope sitched, whose temperature must be kept shoultely uniform during the tent or three hours that may be consumed while the photo-

CONCRETE CONSTRUCTION ON THE RANAMA CANAL

HOW THE EIGHT MILLION CUBIC YARDS OF CONCRETE IS HANDLED

To the untrained eye the work which has hitherto been doise on the construction of the Panama Canal necessarily appears more or less confused and chaotic Although over one-half of the excavation has been completed, very little if any of the priam of the canal has do every little if any of the priam of the canal

works in the aggregate will probably represent the largest mass of masonry of any kind whatsoever hitherto placed in a single engineering own of magnitude it is questionable whether an exception would have to be made sven in the case of some of the famous masonry squednets built in ancient times, and the

Gatun on the Atlantic side of the Isthmus, one at Pedro Mignel and two at Miradores on the Parific side, and the great spillines; in the cauter of the Gatun dam for carrying off the surplus waters. All of the locks will be 110 feet while by 1,000 feet long with a depth over the silis of 45 feet. The three looks at





Note the wooden forms in which the walls are model.

Building concrete side wall—Gatun Spillway.

Band cranes and pockets at Raibon

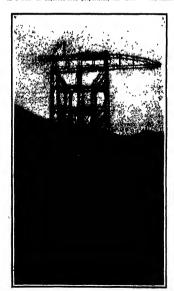
outline of the completed work is therefore irregular and ragged

Some few months ago, however, the work of putting in the permainent concrete structures began, and from new on this great work will begin to take on definite shape and present visual syldence of its massive and permanent character

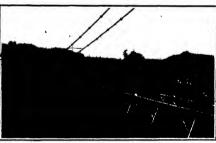
The masonry works will not only be the largest of their kind ever built the locks and spillways being on a scale of unprecedented proportions, but these Pyramide or the first Wall of China are not to be sortened yrechord in comparison with difficult by draulic works of the character of those on the Pannan kanal. In the accumpanying neries of photographs, which were recently taken on the lethnus, one is able for the first time to gain some impression of the massive character of the concrete and reinforced-one crete structures the construction of which is now pro-

creek attractives the construction of which is now procreeding with gratifying rapidity

The concrete work embraces six huge locks, three at Gains will form a continuous structure which, with the piers forming the approaches at each sent, will have a total it night of '1900 feet, the whole week forming one huge monosilith mass of concrite. The Teetre Mignel lock with its piers will be 1800 feet, and the two locks and piers at Mirafone will have a feet of 2800 feet. Into the construction of these locks will not construct the contraction of these locks will sent a mirafone of the contraction of these locks will the sent and the contraction of these locks will the sent and the contraction of these locks will the sent and the contraction of these locks will the sent and the threads the calculation of the sent and the sent and the sent and the threads the calculation of the sent and the sen



Huge statilever scane for placing concrete at Feire Mignel locks.



New 800-foot highway suspension across Culebra Cul



Stone for the concrete is brought from trenty miles east of the canel.

The stone erunhers at Malbea.

Scientific American

hill situated at about the center of the dam, and with in the excavation thus formed is now being laid the sleep concrete licering, the massive relating walls sleep contrate looring, the massive retaining walls and the place he were which will swing the gates for regulating the hight of the water in that great arifficial inland sea which will be formed by the dam it can readily be understood that the enomination

and expeditions laying of 8 une 000 colds yards of concrete in structures of this magnitude called for a spe-cial plant of great size and capacity. At Oston about 100 culde yards of concrete witt be emp The trushed store the sand and the coment for this concrete is handled to the following manner

crusted stone cours from Porto
Bello a small humbet about 26
mites east of Culon along the At-lantic count. The rock is taken
from the quarry by steam shovels and sent by gravity to the glant crushers, and though by gravity to the barges to the lurbor this point it is carried to Cristolal at the Albenth cutrance to the camat and thence era the old French changed, to rac docks at Gatun Here it is unloaded into storage hins by giant grate buckets, up r tween two sets of towers on ofther side of the channel

The sand is brought from Nom bre di Dios, about 40 miles along the coast from Colon It is taken from the sand pits by clamakell but kets, toured into sters purger and taken to Gatun, where it is un loaded by a process similar to that of unloading the crushed rock. The ement is now being shipped from New York At Calon the imment is transferred to barges and taken via the old From h channel to Gatun and unloaded to the storage yards

and unbased to the storage yards. The rock and and storage plots pards, while the have a spacety of about 200 000 cubit yards, while the have a spacety of about 200,000 barrols. From those storage buildings, the rock, and, and rement are delivered theories where to charging are running undermalls. These care, while are electrically operated, carry the naterials to the concept culty operated, carry the naterials to the concept mixing markines located mover the torker wite and discharge it direct to the machines. After the con-crete is mixed, it is dumped into huckets set on flat create is mixed, it is dumped into his kits set on fix cars, and the wars are run to position under the wide cableways spanning the locks' site and from three cableways the hinchest filled with concrete are nowing to position on the locks under construction. The general principles unow whith the plant at the locks on the Parific side is designed are it he same as those supplyord at Guiun, the unchanical details have

those employed at Gatun, the inechanical details have been varied to meet the local conditions. The latest report of the work, namely, that for De-cember last, shows that during the mouth the total work of excavation amounted to 2.618,682 cabic yards and that the total canal axesvation of all kinds amounted to \$,811 681 cubic yards. The material

placed in dams, mainly at the Gatun dam amounted to 340,610 cubic yards, and dir ing the month 57,265 cubic yards of constitution of the constitut

HALLEY'S COMET

Some interesting measures of Halley's comet, made with the micrometer of the Yerkes 40-inch refractor, are published by Prof Barnard in No 605 of the Astronomi error Harnard in No 500 or the Astronomic cal Journal With this large telescope the comet was quite an casy object, and the measures should be good, but, as Prof Barnard suggests, the edges of such a nebulous

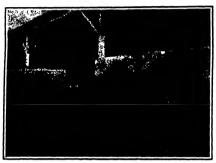
hody are not easy to set on The measures extend up to November 30th, 1909 when the estimated magnitude was about 110, and the comet showed a conden such tite, and the comet snowed a conden-sation of some 7 in hes diameter. The diam eter of the whole object was 41 inches, and possibly an lit-d-fined nucleus was seen, but this feature was very doubtful. From Sep-

this feature was very doubtful. From Sep-iember 17th to November 14th the measured diameters reduced to miles ranged from 15,400 to ' 200 miles the mean being 12,800 miles, or about 1½ times the cartha diameter

the December 1909 meeting of the Royal Antro nomical Society reported in No 418 of the Observa to: the Astronomer Royal ennounced that a photo-traph secured with the Reynolds reflector at Helwan, on August 24th shows the comot's image, its position spaces within 0 t2s in RA and 17 min in declination with the position alculated from the Cowell Crommelin orbit corrected by the Greenwith observa ilons. Mesers Keeling and Knox Shaw are to be con-gratulated healthly upon securing the first known pho-

at In No 25 of the Gazette ant nomique, Signor Pio Amanuelli discusses the probable cmounter between the earth and the comet's tail in Vay next At 10 A M (GMT) on May 18th the comet will pass the descending node of its orbit, while the carth will pass the same point eighteen hours later an encounter between the tall and the earth to row as encounter setween the tall and the earth to take place, it is, shown to be necessary that the latter should be 22,100 000 kilometers (13,712,277 miles) long and that its breadth should be such that it extende from its axis earthward, 400 000 kilometers (2 485.550

The accompanying thart shows approximately the

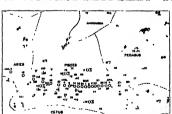


The siniceways, etc., for rapidly emptying and filling the locks are of numeral size WOODEN FORMS FOR SATUR LOCK CONDUITS.

eerding to Mr Cromme pparent path of the comet, as iin a ophomeris up to April 5th - Nature

The Gorindod Gazes in Coal,

The occided states in Coal,
Prof 8 W Parr and Mr Perry larker of the lini
versity of littode have made an elaborate study of oc
cluded games in coal, which is published in a builetin
recently issued by the university As a result of their recently issued by the university. As a result of their work it seems that two active processes are set up immediately upon the liberation of the soal from the mainly constitute of manifest ("Ha, it he second is no absorption of oxygon. There can be little question, moreover, that the alterations proceed simultaneously. There are present in the games from all the anaptice of from drillings, notable quantities of medians, rang. ing from 18 per cent to 86 per cent of the various gas ing iron is pier out to so per cent or the various gas volumes. At the same time the oxygen present drops in a very positive manner, in some cases even reaching the vanishing point. That this transpiration of gases is interdependent and is of the nature of an osmotio exchange can hardly be affirmed as an explanation of



APPARENT PATH OF MALLEY'S COMET FROM JANUARY 6th TO

the phenomenon On the contrary, there seems to be evidence that the gases operate independently of each other

In the case of samples of marsh gas the exudation of CH, seems to have spent itself in those samples held in laboratory containers for two years. In no case is there evidence of further liberation of this asset in tones evicence or nurses: uncertaint of the vacuum An evicuation of the gases from two-pear-old samples shows no marnh gas present. The completion of this caudation would seem to be reached after two months, though it is well to note that by foreing, as with a vacuum, the two-months-old sample may be made to yield more methane, though in relatively small quantities. On the other hand, the avidity of the coal for oxygen seems to be pronounced at the very beginning of the exposure of the freshly-mined material, and while ... there are a number of cases where a certain agree-ment seems to exist between the in-going and the outgoing march was still there are more cases where the lon of oxygen is pronounced without any ovi dence of marsh gas being present. In all cases the oxygen nitrogen ratio shows a positive diminution of the oxygen from the normal ratio of approximately with practically no evidence of marsh gas being present it seems fair to conclude, for the present,

that there is no necessary connec-tion, at least of a strictly chemical nature, between the exudation of marsh gas and the absorption of

Again, the liberation of CH,, while very active in the first few while very active in the first few days after removal of the coal from the ground, diminishes in amount quite rapidly till, after the second onte rapidly till, after the second month, there is very little of this gas in evidence. The activity of the coal for exygen, on the con-trary, seems to be of longer dura-tion. Samples collected June ist, 1906, were tested in May and June 1906, were tested in May and June 1908 There is marked absorption of oxygen in the sample after two days' exposure in the flask to nor mai air, while in a second, with five days' exposure, a still furth nve days exposure, a suit turners reduction in the oxygen ratio without accompanying evidence, also, it should be noted, of marsh gas, was obtained A marked avidity for oxygen was shown after two years

oxygen was shown after two years from the time of collecting. These facts have a direct bearing in the topic of deterioration as sub-stantially defining the limit as to

time of that form of alteration mewhat in different coals, the loss of White varying se White varying semewhat in different coals, the loss of hydrocarbons for the most part it parallelly complete at the end of two months. These facts have a bearing also upon the matter of weathering, and indirectly upon the matter of a continuous combustion. The abortion of varying is undoubterly closely gasedated with both of these phenomens. The studies upon the weathering processes coincide with these studies in gases, assurely, that in all probability this now yope of gases, assurely, that in all probability this now yope of the processes of the continuous processes. Morrover, while under normal conditions there is of ted but a very slight oxidation and loss of fu values, the conditions are favorable, as, for example, for bringing about a very rapid combination with oxy

gou upon an increase of temperature

How far this absorption of oxygen is a chemical
reaction, or low combustion resulting in CO, and H,O,
and how far an absorption into the molecular structure and composition of coal must be left for study

In the Museum of the Louvre in Paris iles a collar of pearls at the point of death! Its death-bed is a plaque of velvet, and it is the large ned is a piaque of vertet, and it is the large collar that was part of the personal estate of Thiors and once belonged to his wife it is simply set and has no artistic value, its material value, however is estimated at \$60,000 It consists of 145 pears in three rows, the total weight of which is 2,007 grains, the total weight of waight is 3.509 grains, the three is reset pearls of the col far weighing 26, 39, and 51 grains respectively. This colar must "die", erery day it loses another degree of its luster, and in the course of the present decade it will become as dingy as a much-worn wreath of

> Why? Because pearls keep their incomparable sheen only when worn by women and come into habitual contact with the gentle, soft, and warm skin of the wes When, for instance, Queen Augusta died it was found that her magnificent strings of pearls were likewise in a persistent decline,

pears were likewise in a persistent cocline, and for the reason, indeed, that for many years she had not worn them on her bare neck (which fact was explained by her age) but only around the fabric of the neck of her watst. At that time a treat-ment of baths in sea-water was prescribed for them

most of baths in set-water was prescribed for them by exports, and for several months, nader obvious necessary preciations, they were suph into the sea and thus recovered their old tuster When, for instance, a collar of pasts is taken from the needs, where, subject to a temperature of 40 deg C approximately it has lain for hours, end is laid apon its marble plate of the dresser, which is perhaps only 20 deg. C warm, it feets, so to spe (Concluded as page 172.)

Scientific American

Carrespondence.

MR. RIEDERRE'S PROBLEM.

To the Bilitor of the SCHRITCHE AMERICA

Your correspondent who replies to my problem cer rour correspondent was replies to my problem cer tainly has not studied the question very closely There is absolutely no doubt as to the possibility of the selution for taking any single number, it is quite syldent that the remaining 14 numbers will make 7 pairs, each one of which with the taken number forming a different combination of three What ber formäng a different combination of three What combination of three What combinations are supported by the combination as to the combination as told are passible in The question is, how can this or any other sphittar problems be worked out without a haphamard shifting till you got thos obtained. Find the, spaten The problem is all right New Yorks (1944 Hayasar & Rizkonaz, Ph D

OMERNATIONS OF A REPECE IN FLIGHT
To the Million of the Scientific American
I have sign no mention in the newspaper of the
meteor that fell west of Corrington, North Dakots, on meteor that fell west of Corrington, North Dakota, on January 10th. It was seen for seventy miles south of Streeter, North Dakota and passed over us with great speed. It buried itself six feet in the ground about seventy miles north of Streeter The heat pro-duced was so great that for forty-eight hours no one duced was so great that for forty-eight hours no one could approach it closely notwithstanding the fact that the ground was covered with amov and was frome to a depth of four feet. When the meteor passed over our heads from a southwesterly direction to northheat. It shope most hrillinatity. The noise which it produced can be littened only to that of a very large cannon ball in flight. The diameter of the noteor is of inclus. It has been taken out and sent to Blumarck Streeter, N D

SOME STRANGE ANIMAL INSTINCTS.

To the Editor of the Scientific American

To the Editor of the SURTINI AMERICAN
Two items in your science column of January 8th,
1810, interest me That about the return home of the
litten and cat because there are scientists in you
own city and showhere who have held deggodly that own city and elsewhere who have held dogardly that the special seaso of this nonderid ability to go back home is not a special as now but the result of some sort of observation, although the cat may be blind folded. They even claim that homing piecons find their way back by observing the lit of the country. While this instinct is by no means surering, and to developed to a runth greater existent its sense individ developed to a runth greater existent its sense individ uals than in others, there seems no justification of the donial to these lower crustures of a faculty of orien donial to these lower creatures of a faculty of orical lation or traversing which man possesses in only a small degre. There are many instances where the return has been made over a route very different from that of the outgoing journey and could not have been influenced by the topography, even if it could have been ubserved

The other instance is that of the magpio which was fond of rubbing tobacco and its ashes into its plumage as mentioned by the writer in Kosmos. This is of special interest to me because I had made a similar observation on a hinejay—a relative of the magplo-and had never so far been able to confirm it from and nad never so har been able to contribute any other source Fortunately as long ago as 1886 I recorded it in my little book "The Story of the Birds" (Appleton) from which I venture to quote

"I saw him (the jay) engaged in the wainut tree one day in late summer in a manner that made me fear that his bath had not been sufficiently effectual He would pluck off a leaf, lift his wing and rub it into He would place of a leaf, lift his wing and rub it into his pinman i saw him do it repeatedly, and are saw and trose have a puspent odor and are disagreeable to insects, if feared that he had some guests had were trying to get rid of If this theory should be correct here was a case of a blief using period with at least good intentions." (Fugo 243) II is well known that does and other manmais will rub their bodies into ur against something that is strikingly doctons, for the sake of the perfume of a strikingly doctons, for the sake of the perfume only in which they seem to delight, but those two are the only instances that I know of where hirds are the

in which they seem to designt; out touse to an too only instances that I know of where hirds are re-corded as doing the same. It would be interesting to hear from any other instances—if there are any, as is likely James Newton Bassery

RE-ARMING OUR WARRIES.

To the Editor of the SCIENTIFIC AMERICAN

In a tetter to the SCHENTIFIC AMERICAN of September 5th, 1908, a correspondent, Mr A. B. Wingfield, sug-gested the rearming of our "Cooncoticut" class of battieships with four 12-inch guns in place of the eight 8-inch that are now carried in the main battery of this Sinch that are now carried in the mann naturey or that type. The Bidfort's comment at the time was that the greater weight of 12-inch gun emplacements on the beam would necessitate too costly structural strength onings to justify the change, that the 4-inch armor protection would be too light for these emplas ments,

and that the increase in dead weight would sink the aiready low armor belt avon fewer in the water A previous letter appeared in your issue of August 15th, 1908, and since then changes of title character have

I know that if the SCIENTIFIC AMERICAN takes up this matter, its influe nee will be brought to bear on navai men, the object in view, of course, being to make dreadnoughts of the "Connecticat' type and wemi-dreadnoughts of the 'Georgia' class. The younger officers in the navy whom I have questioned in regard to this matter are manimously in favor of these im movements

As armed at present, the "Connecticut' and "Geo: gia' classes are not as efficient as a comparatively gis classes are not as efficient as a comparative mail additional expense could make them, and in view of the conceded superfortly of the fall hig gas type of ship, if seems worth while to consider how it would be possible to so reconstruct the above type as to make them more formulable against dreadoughts. The pre-eminent function of a battleship is to constitute the greatest efficiency and power possible in a nigite vessel. The armanent of the "Connecticut"

a single vessel The armament of the "connecticutions consists of four 12-line leght 8 inch, 12 7-lineh, and twenty 3 inch, of which four 12's, four 8's, six 7's and eight 3s can fire on broadside The "Georgia" type mounts four 12 inch, eight 8-linch, twire 6-linch, and twelve 3 inch, of which four 12's eix 8's, six 6 s, and six 3's fire on broadside. Now to convert these ships to dreadnoughts it would be necessary to mount one 12 inch gun in pince of the two 8s in each of the beam turrets keeping the emplacements as they are

beam turreds keeping the emplacements as they are As the 7 livel guns are too amall for battle ranges and too slow for turpe do defense they could be sub-stituted by the 5-linel rapid fires which are now being mounted on all our new dreadnoughls. With say registern of these and a few more 3 pounders in place of the present twenty 3 inch gaus, the change is com-plete and you have a vessel the equal of the "Michican't you which are really nowerful dreadnoughts on cticut, qinbjuccus ut

In the "Georgia' class the same remuvat he made, except that the four superposed 8's would have to be retained and the six additional 5's omitted have to be retained and the six additional is emitted. The 'idaho', and 'Mississippi' could be similarly treated. Under this arrangement the armanesi of the two classes would now be 'Connected' eight 12 inch and eighteen felich with a breadside fire of six 12s and time is "Georgia" six 12 lisel, four 8 inch, and twelve 6-inch with a breadside fire of five 12s, and twelve o-inch with a brandsidu into ot ave 12s, four 8s, and six 5s. Then our two. 'Idahas, four 'Georgias," six "Connecticuls" two "Michigans" and two "Delawarva" would mount 124 12 inch gums in stead of 84 as at present, and would practically be a dreadness t fleet. The benefits from these chauses are as follows

- A homogeneous broadaide giving greater con centration of fire at battle ranges
- 2 A simpler system of spotting and fire control, with unity one range to get and only one caliber of gun (excepting the four "Georgias") in the main bat
- A greater efficiency of ordinance resulting from uniformity in ammunition and conse more united
- or organization for and the quicker deliv ery of shell
- й An opportunity offered to hold former 7 luch gun crews in r serve for turnet crews The c instraction of unwieldy and innecurate mid
- die hatteries with large crews necessary to their serv ire in exposed positions
 7 A smaller number of mon in action at the
- time and behind heavier armor (Le, turrets only) at
- battle ranges
 8 An increase in the efficiency of torpedo defense
 1 and the object of t by a gun more practicable in every way than the ok caliber, which was ineffective at 3 500 yards and re
- caller, which was inspective at 3 years and re-quired the same number of men to handle it 9 The lightening of the armor bett and hringing 10 The placing of the ontire main battery behind

Now as to the cost For one battleship of the necticut" class to be improved as shown above, the ex-pense would consist chiefly of the price of four 12 inch and eighteen 5-inch rifles, and the remodeling of the Sinch turrets and handling roome The 5-inch guns Sinch turrets and handling roome The 5-inch guns could occupy positions behind the old 7 inch barbettes, on the gun deck the 3 inch casements (alightly en-targed) on the main deck and new mounts for the superstructure I do not believe that the structural part of the ship would need strengthening in any way Moreover, all these discarded eights, sevens, sixes, and es could be mounted on smaller cruisers, where they could do the work required of them, and thus

oney on new construction could be saved.

I think that you will agree with me in saying that the these improvements made our pre-dreadnought. with the type will not only possess far greater efficiency than they do now, but also that they will be able to stand

in the first line of battle with future dreads The real question is this. In the greater efficiency worth its cost? In view of the slight difference in the cost of maintaining to commission a "Connect cut" and a "Delaware," I think it is and the Scryttic American can do a lot toward making these paper changes realities. Brooklyn, N Y HAROLD M. KENNER

publishing this interesting study in publishing this interesting with or a mich mooted question, we would point out that it seems to be the unanimous opinion of oaval men in all cavies that the re-arming of the older ships does not pay,

that it is programing or its of our saips more inc. is a.y.
that all appropriations for construction should be put
into new ships. Such changes as are suggested above
would involve enormously costly siructural work on
the huits. There is no room for 12 inch guins in the

The New Supplement tutalogue

The publishers of the Scientific American have issued a new catalogue of the Scientific American Supplement in which 20,000 articles are listed Many of these articles have been translated from foreign of these articles have been translated from foreign publications which are ordinarily inaccessible to Eng-liab-speaking readers. Many of them also are papers read before the incrine discolates societies of the world and accessible only in a few large public libraries. The articles are all carefully inferred so that the information on any particular scientific subject may be found in a few minists. The catalogue will be sent graturiously to all who apply for it

700 / 000

The current Suits ways, no 1781 contains some remarkable pictures of the Soven Wonders of the World, together with a good article on them "The Fractical Utilization of Insect Parasites" is the title of an article which will interest the farmer that artists which will interest the tarfiner that the Municipal interest and the function and Explosion, a Primer on Explosives for Coal Miners' is published Some best uses of paper are described. Mr. D. A. Aribur tuniributes an article are described Mr D A Aritur cuntributes an article on Chinese calendars Since the Chinese have just colorizated their new year, this article comes out with perticular timelinese H A Humphrey's paper on an internal-combustion pump is convluded Leonardo da Vinci, perhaps the only truly all-around genius of the world, is the subject of an excellent article by Edw P Buffet The Wright injunction is summarised

Comete Due to Beturn This Year.

in addition to Hailays, two other comets are due to pass through perihelion this year. The first is known as Tempela second periodical comot, discovered known as Trimpr's second periodical come, discovered in 1873 July 3rd at Milan its period is about 5½, years, and it was re-observed in 1878, 1894, 1899, and 1804, making lis perihelion passage, on the last occa-sium, in November, it should therefore return this coming spring D'Arrest's comut, discovered in 1851, in the second object, and is due to return during the summer of this year. Its period is about 61/2 years and it was re-observed at its return in 1857, 1879, 1877. 1890 and 1897 but it escaped observation, being un favorably placed, in 1903

Mr Lynn, whe gives those particulars in No 418 of the Observatory also recalls some of the historic oc-currences which have coincided with the returns of Halley s. comel.

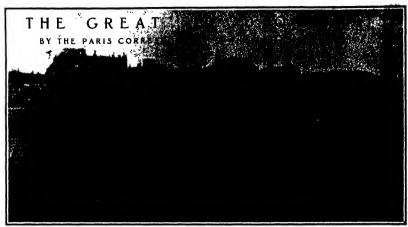
The Scientific American Fourth Dimension Book

The renders of the Brit Stirk American have hardly forgotten the Science America's Prize Competition for the best simple explanation of the Fourth Dimen for the best simple explanation of the vortal biness.

The prize of \$700 was awarded to Licui Col
Graham Danby Fitch, USA III ceasy was published
to the Scientist American for July 4th, 1902 and
three others which were seconded homorable mention ly the judges followed in successive issues

It seemed to the judges that of the 24% essays sub mitted, a certain number showed more than passing lnasmuch as the popular literature on the sub nert! Inammuch as the popular illerature on the sub-plot is by no mesee extensive, the publishers decided to lutrust to Prof. Henry P. Manning of Brown Ulsa-credity, one of the judger the book of selvilina some of the best contributions. This Prof. Manning has doon. These search (outplots with the resays which were awarded the price and honovable mention, are now published in a book which has just been instead. by Munn & Co publishers of the Scirviffe American An elaborate introduction is provided by Prof. Man-ning, in which he critically and yet simply discusses fourth-dimensional geometry and gives an excellent hibliography on the subject. The book sells for \$150 and can be ordered through any newsdonier or book-

The deepest coal seams mined in America ite above a depth of 2 300 feet some of the coal mines in England are developing seams at a depth of 7 600 feet while coal mining is carried on at a depth of ab-



The Seine near the mint-

The inundation of Paris made many of the streets of that metropolis as navigable as the canals of Venice. The highest point reached by the water was 31 feet. I inches above the normal at the Pout Royal Not. since the historic flood of 1615 has Paris been visited. hy such an inutuation. On January 29th the waters began to fall, and the city for the first time began to feel safa Even as it was, the Heine was swollen to thirty times its ordinary volume and the current raced thirty times its ordinary volume and the current need to the sex tweety times faster than usual. The banks have been overflowed for from half a mite to a mile on either side. That was and wonderful sewer system which figures so dramatically in Victor lingo's 'less Miserables and which has been dwelt upon time of the miles of the side of the catastropic They served as conduits for the food liuge as they are, they were unable to cope with the indee as they are, they were under to copie with the infibilius waters. Pavent its were present upward, and the water bubbled up into the streets. Apprehension was felt for the safety of the monunicities of the Trench capital, an apprehension which is not yet stilled it seemed attackt certain that their foundations would be sapped. It speaks well for the work of French engineers that none of the twenty four bridges Freuin engineers that none of the twoult your prices that span the Schie was carried away, and that it was found necessary to tone but eight of them. On the other hand, these bridges undoubtedly helped to dam the waters and to aid in the tilty s hundration. It apseaks well for the architects and masons of the middle ages that the famous Cathudrai of Notre lame.

should have stood in a lake for days and days without should have stood in a lake for days and days without autforing injury Many of the historic buildings of Paris were flooded, but fortunately the art treasures seem all to have been preserved with little or no linjury When the saturated ground dries out and con-Hilling When the saturated ground arrive out and com-tracts, it may be that some of the hulldings will settle and possibly collapse The Louvre, although flooded, was still able to serve its function of housing its price-less valuatings and its statutes. The great above could

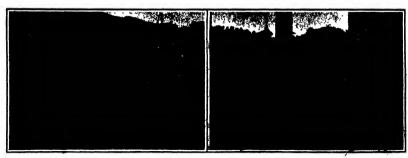
was still able to serve lis function of bounds its priva-less valshings and its statuse. The great shops could not be queed on account of the water. The fanous relative Francis still gave its performances, but it used candice as it did back in the days of Moliter It was but intured that the Chamber of Deputies should have continued its assains a neithblitto of right on the part of the legislators would undoubtedly have height-oned the public teror. As it was, the numbers were derried arross the square to the cham-

members were ferried across the square to the cham-bor The old Latin Quarter and the Champ do Mars, the Rues Royale, the Roulevard Haussman, the Place do in Concrote, the Champs Elysele were awamped Naturally the subways nuffered heavily Only the Gree du Norde seems to have example. The station of St. Lazaro seems to have example. The station of St. Lazaro seems to have example. The station of the way to be suffered most awards and the station of the way to be suffered to the station of the stat It was, the suburban traffic was entirely cut off, as that the sparing of the care dis Nord served simply to give the frightened sepates a place of questionable give the frightened sepates a place of questionable that is the server (the theme of many a thritting French short slowy) and of the baseman and sub-cellars of Farls were able to seeaps. Suburban towns 19ting somewhat tower than the city have suffered The hereaking of a dyke completely inundated Gennavilliers. Its community of 10,000 per-

driven out by ten feet of water

Paris may now be considered safe from water, but
the danger from sickness still prevails. The steach the tanger from sickness still prevaits. The steatch of the stagnant water and of the drowned animals will undountedly continue for days. The Paris health authorities will find difficulty in coping with that altuation

authorities will find difficulty in coping with that attuation. The actual cause of the flood has not been fully revealed floon explain it geologically by arruing that will winter, characterized by beavy rains and ittie theory to await the lawstigation of the municipal captions. Only when the floods have subsided and a careful examination can be made, will the full measure of the disaster be assertained. The accounts of brareful as well as the subsided and a careful examination can be made, will the full measure of the disaster be assertained. The accounts of brareful as well as the subsequent of the flood have been sufficiently dis usued in our editorial of February 8th. For that reason the results of this Paristan intendation of the flood have been sufficiently dis usued in our editorial of February 8th. For that reason the results of this Paristan intendation either the channel of the Select must be widness of either the channel of the Select must be widness of either the channel of the Select must be widness of either the channel of the Select must be widness or either the channel of the Select must be widness or exited a waterway around the city, a waterway which will serve the purpose of disturding the surplus of the Select in time of food and of discharging it below the city.



The conductors of Paris.

A cart-ferry to one of the stre

The total area of the peat bogs and moors of Germany is more than 3,000 square miles, of which about two-fifths are situated in Hanovar and Schleswig-Holstein. The Prussian government possesses in East Prissland nearly 40,000 acres of upland moors, of which about 16,000 acres, known as the Anrich, or Priedeburg bogs, have for some years been the acene on with great skill and energy, though infortunately with a degree of secrecy which makes it difficult to assertain the exact facts, sithough the undertaking is assertant the exact facts, although the undertaking is of the graphet and most general importance it is contemplated not only to reclaim the moors for cultivation and nettlement, but also to make them the source; of energy which

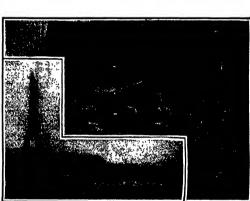
at a property wants at her light and power the transferred in region thirty that a spitus of thirty that Martin ight, thus d. M. already suphaven ned several other es said towns, and large antities of ammonia, hy-agen suiphide, and other scous products are sold use in various indusreclaimed lies between the Ems-Jahde canal on the north and the Nordgeorge-sehn canal on the south, between which a connectcanal will be con connect the system with the canals of the older moor enlantes to the west ward. In all, 38 miles of new canals will be re-quired. Their construc-tion will necessitate the stripping of about 650 of moor, from which it is estimated that nearly 350 million cubic feet of ŭ peat will be obtained work were done by the old Dutch mothed, the ls would not be fin-

ished in several decades, during which period the price sased in several decades, during which period the price of peat, already very low in this district, would con-tinue to ducline Both of these difficulties were avoided simultaneously by the adoption of cleerical methods, by which the work of excavation is carried on very rapidly and supplies its own fuel In the center of the moor is a boiler plant, which consumes pea exclusively The problem of course, will be still more simplified when a method of producing electricity di-rectly from heat is developed

The first settlers established on the Friedehi The inst sources established on the Freedening moof will carry on what is known as surface cultivation, and will at the same time gather peat, which they will sell to the electrical company, the charter of which runs for seventy five years. As the high moor is thus cut down the method of cultivation will be gradually changed to that which is employed in the low-lying of Holland

All of the energy is supplied from the central power tation of the Siemens-Schnekert Company, situated

on an island in the bog at the intersection of two main roads. From this point wires, supported by poles, radiate in all directions, supplying light and power to the whole country for many miles around The main canal is bordered by soveral rows of poles and wires, one for the telephone, another for the peat digging and agricultural machinery, a third for the high-teasion alternating-current long-distance service Current was to be supplied to the surrounding cities in November of this year. The station is soutpose with two steam turbines of 1,300 horse power each The great plows used for the excavation of the canada have long been driven by electricity. The past dis-sach day is compressed by electric precesse into 4,500 hicks, which when dry are used as fael in the central high-tension alternating-current long-distance service



Scenes from the great Paris flood.

station In the gas generators 40,000 cubic feet of fuel station In the gas graculary 40,000 cubic fact of fuel gas and 30 pounds of ammonium sulphate are obtained from 100 pounds of peat. The combustion of this quantity of fuel gas grain rates 273 horse power hours of energy, while the safe of the ammonia compounds pays a good interest on the capital invested. Con tracts for supplying light and power to most of the tracts for supplying light and power to most of the surrounding towns and cities have aiready been signed. The duration of the contract in most cases is forty years, while the charter of the Siemens Schuck ort Company will remain in force seventy five years The area assigned for cultivation and settlement com The arm, assigned for cultivation and settlement com-prises about 17000 acres The digging of the canal requires the peat to be removed from a strip about 150 feet wide, so that the construction of the 15 miles of canal will invoice the stripping of 500 acres. The average depth of the peat is 11½ feet. Deducting the superficial airctum of 70 inches, which is compare tively worthises the disging of all the canals will about 247 million cubic feet of peat, which

when dried will furnish 1.1/3 million tone of fuel post This amount of fuel sione would supply the central station, producing five million kilowatt hours of en sixty-six years On each side of each canal, a strin 165 feet wide is to be cleared of post for cuitivation and settlement. The peat thus obtained, added to that obtained from the canals, would enable the capacity of the station for the duration of its charter be trir

An idea of the cost of the electric light and power thus furnished may be gained from the contract re-contly concluded with the town of Baut, in which the of lighting current is fixed at about 10 cents and that of power current at 5 cents, per kilowatt hour At these rates a 16-candle carbon incandescent

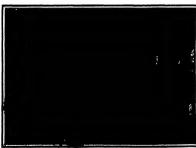
lamp or a 40-candle metal filament lamp would cost about 12 cent per hour and an arc lamp from 2 to 8% cents per hour ac-cording to its candle power Thus the Friede hurg bogs are to be util-ised as a field for colonisation as a suprem of tight r the surrounding coun try within a radius of 30 miles, and as a cheap and reliable source of power for all the cities and farm East Friesland. though all the hopes which have been built on the en terprise may not be ful filled, it is already certain that the recisionation and cultivation of bog land has entered upon a new and promising stage of de velopment in consequence of this application of elec-tricity. It must be admit ted however, that on the Friedehurg moor the con ditions for reclamation ditions for reclamation are especially favorable The land is in general level, and it has already been superficially dried and smoothed by hurning moor are already bordered

with rankly-growing grass

Peary a Rear Admiral, Commander Robert E Peary has been made a roar admiral of the highest grade and with maximum pay, so far as the Senate can accomplish such recognition of his services. The bill recently introduced by Se at the services. The bill recently introduced by Senator Hain was favorably reported from the Committee on Naval Affairs and promptly passed without dis

The bill authorises the President to appoint Comor Peary a rear admiral with an extra numb and places him on the retired list. An amendment was adopted giving him the pay of a rear admiral of the first grade

the first grade
The top notth pay of a rear admiral is \$8,000 a year
and that of the same officer on the retired list threefourths of his active compensation Thua Admiral
Peary will receive \$8,000 a year for the remainder of Thus Admiral his life.







The submerged Rue de Lyon.

Industrial Chimneys and Water Towers of Concrete Blocks

BY H. PRIME KIEFFER

The employment of concrete blocks for the construction of factory or industrial chimness and water low ers is one of the most mand use of that new form some some or tree gives matter to use of that the defent of utilizing separately modeled blocks for this per passe should have come from kayage look of Amer les where thooks here found a wider range of use than in any country in the world. The wistern is the then in any country in the worm. The exacts is the that one for the supplier could be factory commerce in the United States there have been in use some techny different systems in which armored control is employed but they all have some primary form of scarfolding in their designs. This is the underlying scaffolding in their designs. This is the underlying reason why those chinneys cannot be constructed once economically and rapidly. The nethod of constructing chinness of separate model of our rich blocks is the overallon of M. Dunnas, an engineer and medited of trusse he is lightness. ct Pils also of Harsa is who furnished the data and plattographs for the present article. The system is notable for its samplicity its hearts of furni its econ only in cost, and its adaptability to rapid construction

The chimness on 1th all others in that they are tounned of three pasts the foundation the base and the shaft. The shaft is formed of reinforced tour rete

of a special design. The form of the blocks is shown in the accompanying dia gram. The number of blocks in each course al ways remains the same, yet there is a taper to the chimney They are placed in regular horizontal courses to the required height and upon the log is placed a special capping block of either concrete cast from or cut slone The builders work on a rough platform and from

the interior of the structure and each block is re colved by them ready for its particular position Two men are usually em played above in laying the blocks, and two below to holst them to the platform The blocks in each suc The blocks in each sic coulding course are placed in the opposite direction, that is to say, all the even courses will have the same direction and all the odd direction and all the odd courses will take the re-verse of little in this man-ner, the joining of the blocks of one course where they do not meet perfectly will be covered by the blocks in the course by the blocks in the tourse above As shown in the diagram each block has at one of its extremities, a 'hook' similar to the shape of the letter 'II'. This "hook" forms a hollow span which ex-tends the full length of the chimney and of course there will be just as many of these hollow spa or these hollow spaces as there are sides to the chimney. Through these vertical hollow spaces are placed vertical from rods B, varying in dismeter ac cording to the height of cording to the negative the structure. At each course these rods are tied or bound to the courses by Ushaped flat from your bound to the courses by Ushaped flat from your bound to the courses by Ushaped flat from your bound.

These in turn, are wired to a small fron red
D which is placed between the courses borizontally
and in a grows made for it in the top of the blocks.

The plucing of the virtical rods in the eponings

and not in the substance of the shaft proper forms an important advantage of this system. The rein forcement is thus kept at a low temperature, and is not subject to the injurious effects which would arise nor subject to the injurious where where would arrise from the qual expansion if the steel was in the cen-ter of the mass. Ferro one rit is infertructible by fire so long as the temperature of decomposition of courrete is not reached but it must be remembered. that allimigh the coefficients of expansion of cement are the same, the coefficients of conductibility are

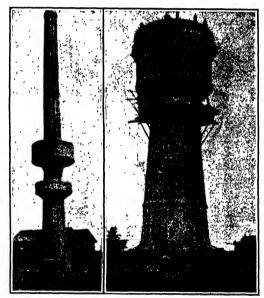
very different, and fracture is likely to arise if, from this cause, the temperature of the iron exceeds that of the concrete Consideration of this condition is espe important in the case of a structu heated on one side only, such as a chimney

A clever idea in connection with the design of the blocks is that there is need for only three, or at the ost, four sizes of blocks for the average chimney of



- The vertical steel reinferri The concrete of the block

Cross section of a portion of a concrete water tower Section at one end of the joining of two of the coarses.



Concrete block chinney carrying two

Concrete-block water tower for the 1910 International Expedition at Branchs, Belgium.

INDUSTRIAL CHIMNEYS AND WATER TOWERS OF CONCRETE BLOCKS.

150 feet high and with a taper of one to three per cent This is made possible by the following arrangement
The model by which the blocks are made con
sist of but three cast-iron plates, held together by
wooden stop blocks, and three ordinary iron clamps
Different sizes of blocks can be made therefore, by Different sless of blocks can be made therefore, by simply changing the relative positions of the plates and the wooden slop blocks. After the blocks are moised, they are placed in the following manner Take, for instance, the first row, at the block strend naturally the block are of the largust size, and the arm of the block in the longset. The arms of the blocks of the block are of the edge of the blocks of the block as did in the extreme the arms are placed just as little ratther block the blocks, and this placed just as little ratther block be blocks, and this

onch stoccooling course has a diameter smaller than the one below it, and in this manner, the taper of the chimney is obtained. As the longest belosis are some three feet in length and the distance across the seni-irrelate opening about site to eight inches, it is possible to make a considerable toper in this manner. For its changed every frest or fifty freed. The bloods may, of course, be laid with absolutely no isper, and then one size, only, of thocks is used. Some spikeneys have been constructed on this plan, but their appearance in not no generalize at these harders, and the superance of the control of the co

in the same district. The proportions for the commixture vary somewhat, but the usual mixture sists of about five parts gravel, three of sand, and two of coment. Dust of stone is used sometimes, and has given very good results. From an archimetural point given very good results. From an archimetural point.

\(\tilde{\text{view}}, \there \text{chinucys} \) econstructed with this system
present a pleasing appearance Being thinner than
\(\text{view}, \text{they rise} \) more gracefully from their
\(\text{lames}, \text{and yet the strength and stability which they

h and stability which they actually possessib at once suggested to the eye by the appearance of strength which is presented by the protrading rounded angles. A number of oldnings; and water towers have been built in Europe after this system, and the two photographs presented in connection with this arti-cle show a water tower. connection with this arti-cle show a water tower, and a combined water lower and chimnay. The water tower which is lo-cated in Urele, a suburb of Hrussels Heigium, will be used in connection with the 1910 exposition to be held in that city The tower and tank have a height of 145 feet and initer has a capacity of 280,000 gailons The struc-ture is circuiar and is built entirely of concrete blocks and without mold ing of any kind excepting that need in the building of the concreto reinforcing struts surrounding the base of the tank proper The inside of the tank is inclinate of the tank is stories connected by a winding stairway. These different floors are divided into rooms which will all be occupied by engineers, foremen and other work men during the exposition The stairways are placed along the outer walls and the water remains in the center inclosed by a con crete covering of square

Oil That Cold Will Ret Affect.

It is often difficult to keep machinery properly oiled in cold weather, as

Belgium. olled in cold weather, as the oil freeze in the oil belgium. Office.

Office. Office.

In his presidential address to the America In his presidential address to the American Street and Intervalvan Rallway Association, Mr Shaw, at Donver, said that is round numbers there are 1.250 street and intervalvan rallway companies in America, with a total of 35 900 miles of single-track and 75,000 passenger cars. The passenger carried annually in 19,000,000, and the green income \$44,000,000.



THE CONSTRUCTION OF AN IMPROVED SILICON DETECTOR ST 41

The detector described here is one that can easily The detector described here is one that can easily take the name 'improved', being a radical departure from the coarsely-adjusted detectors generally used if properly constructed and connected, it will easily pick up wireless messages sout from very distant points. The component parts are shown in Fig. 1

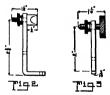
se of the instrument is fashioned from hard rubber, 3 x 2 x ½ inches, ½ inch beles are bored in it one inch from either and A support for the expetal cup is made from annealed brass, 4 inches in length ", inch in width, and 3/16 inch in thicke bent to an L shape, as can be seen in Fig 2

The crystal cup is turned from brass rod 1/2 inch in diameter it is ihreaded, as seen in Figs 1 and 2, to fit a thumb nut. The crystal is fastened in the cup by means of lead. This insures a good contact. The ad



Tiq. I SPOTTOWAL VIYW OF THE ASSESSMENT DETECTOR.

justing mechanism can be made to move a steel hair suiral, the point of which makes contact on the silicon to the thousandth part of an inch. The phosphor bronze strip upon which the suital contact is fastened is 3 inches in longth, 1/2 inch in width, of No 28 B & S gage sheet it is boiled to a cabe of brass which in gage shiet It is boiled to a line of brass which in lura is fastened by means of a machine acree to the lease. This stree acrees also as a binding post. The brass not supporting the adjusting scree is of 3/16 inch brass of the same stock as the Lubaped post II is 2½ inches in longith, % inch in width, and 3/16 inch in thickness. A ½-inch hole is borred ½ inch from



SUPPORTS FOR THE CRYSTAL AND THE ADJUSTING

one end to admit the machine screw that hinds it to th hrass cube Another hole is hored 1/2 Inch from the other end and tapped to fit the adjusting screw. The adjusting screw has a large knowled rubber handle for adjusting purposes, also a lock nut to be tightened when the detector is at its most sensitive point

This detector is comparatively easy to construct and is inexpensive. The one undesirable quality in silicon is inexpensive The one undesirable quality in siliron detectors—their ability to get out of adjustment—is almost antirely eliminated in this detector, due to the use of the spiral instead of the solid contact

INCREASING THE EFFICIENCY OF WIMSEVEST BLECTRIC MACRINES. BY GROSES J BURDOUS

The Wimshurst static electric machine, as is well known, consists of two glass i freies revolving on a com-pound axis in opopult directions. As usually made, this machine is inferior to the Toepler-Holtz type, al this machine is interior to the temperature type, as though somewhat cheaper to make, and superior in simplicity. The latter quality has been without doubt one of the chief reasons why it is in general use wherever the small electric discharge this machine will give as commonly made, will answer the purpose. In building both kinds of these interesting ma

chines it is the practice to varnish the revolving gi circles with white shelias dissolved in alcohol. In the higher grade machines the best quality of sheliac and grain alcohol are used for this varnish buffer the toy grain alrobol are used for this warnish but for the toy variety would alcohol and the cheapest grades of shellar are used. Some years ago the writer was building both Whushurat and Toopher Holtz sixties, but was un-able to obtain a discharge from the Winnahurst 19je that (ould compare with the other kind, even when the glass circles were of the same diameter The development of the machines in both cases had

extended over a series of years, and it was supposed the limit was reached. At this time the Toepler Holtz the timit was reashed. At this time the To-epter Hoffs muchines were giving with 26 inth tircles aparks unding the Leyden Jara) equal to the radius of the circles or 13 inclus long thick as the thumb and when discharging deforating like the sound of a rife

The Winshurst machines with an equally large cir-le would not give sparks over 4 inches long, and about as thick as a knitting needle Finally, in building a lot of alx machines it was found some were much bet ter than others. Strengous efforts were made to ascer ed the increase in officery hat witho discovering anything different in the construction of those that showed the improvement from the others those that showed the improvement from the others in the noxt lot after this, however, all of the mashines were capable of giving sparks 6 inches long, nithough the diameter of the glass circles was but 14 inches The thickness of the spark had also increased to the size of a pipe stem and this wanderful increase of officiency was altributed to some quality inherent in the glass of which the circles were made but inquiries made of the manufacturers of the glass failed to disany different methods of making the glass than lad been followed for many years
About this time the writer in varnishing s

tes held one of them up to the light and was struck by its light green apparame and although giving it little attention at the time gained the impression that this change in color might have something to do with the increased efficiency still unaccounted for after this a now lot of machines were built and every one of them had reverted to first principles so far as the spark was rouvered it being short week, and spindling in the effort to find out what had consent the reversion the writer called to mind that just be fore varnishing the last lat a new brush had been use in a new batch of varnish

il is rustiquary in making the varuish to disthe shellac gum in a glass jar with a mouth ju crough to get the brush in conveniently and the brush is left in the jar between the construction of the differ ant tota of machines. It was found that the old brush had las n shedding its bristies, and to prevent this had been bound around with some fine copper wire The action of the varnish had been to correde the cop-per and the salt had given the varnish the faint green color noticed some time before on the glass of cles, although there had been nothing different in the

edor of the lody of varnish in the jar apparent.
The suspicion dawned on the mind of the write that this had been the cause of the increase of efficiency and the tack of it in the tast tel of machines. Anothe batch of varnish was accordingly made, and in it was put about a quarier of a poind of fine bare copper wire. A new brush was procured and placed in the jar and the varnish allowed to stand in a warm room about a week, when it had assumed a light green color, and was used to coat the circles of a ne

chine This machine was found on trial to be even mor-

efficient than the best of the others in experimenting with the newly discovered varnish it was found that if il was allowed to become a dark green the vottage of the machine was interfered with and while the spark would be thicker it would not jump as far. The best results were obtained who the color was a very light green. The reason for the in creased efficiency was thought in be due to a decrease of the resistance of the shelts; between the sectors on which the equalizing brushes boar

which the equalizing brushes bear This variable was tried on Toeplev-Holts machines without their shosing any marked increase perhaps due to their being air ady capable of delivering sparks equal to the radius of the giams circles

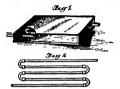
The use of varnish made in this way will be found The use of varsish made in this way will be fooled by amateurs and others to add greatly to the capabili-ties of the Wimshirst ma bine, and besides the light green color on the glass sides to the beauty of the in

Many builders of Wimshurst machines as well as one experimentally inclined have trouble in making to brass sectors atick to the shellar. As tinfoll soon wears through from contact with the equaliser brus weens through room contact with the equatine runsing, thin sheet brans is used by many on the better grades of machines to secure durability. Brans sectors can be made to sick permanently in the following manner. In variabing the trevies about three coats is gon erally applied with a large flat camel's hair brush

Each coat is allowed to become motorately hard be-fore applying the next. After the last coat is ap-plied, and has stood about lifteen minutes mark the ocations where the sectors are to go (they sh evenly seacod), and after apply tog some varnish to the under side of the sector, press it down into the soft varnish until a slight ring swells up around the murgin of the sector After the varnish is hard an examina from which it will never separate as it wilt if cenemical in any other way on account of the expansion and con ractions of the brass being so much greater than the glass, and causing the sector to become loose

SILVERING GLASS AT HOME.

A good gloss infree made with one a own hands is a thing to be proud of Mirrors are now seldom nonde-by the third and more are process because of the dimerrors character of the work but pure after to The ellier process is not in the least dangerous to the workman. The formula here given is one that has been in use in several looking glass and art mirror factories in the city of London



APPARATUS PROTURED FOR SILVERING GLASS.

thembals used must be of absolute purity (chemically pure) and all operations in preparing the glass must be carried out with care and scrupulous cleanliness rises to be alliered must not be proused upon by the fingers or thumbs they would leave an indelible

The first thing to be done to be make a The first thing to be done is in make a sinci i cause out of a piece of salar about \(^2\), or \(^2\) In int thick 10 or 12 inches wide and 18 inches long. These measurements are not bludding, any piece of sist is lead the above size will do A wood in trough must be made. above size will do A wonden trough unust be under with groovers at the tup-rejax for the slat slab to rest. In There must be a space of 2 inches between the state slab to bit, woods abottom as indistated in Fig. 2. In this space, is a cell of pipe arrange d as shown in Fig. 2. The pipe lost slates! No the howe and through Fig. 2. The pipe lost slates! No the how and through slate slate to slates! No fig. 2 in the lost of the slate slate to slates! No fig. 2 in fact just had except for the hand to lear. The states can be supplied from an ordinary fea kells placed near the dequaliting table with a rubbe r tube connecting the cell to the apost of with a rubber tube connecting the coil to the spout of the kettle. Uniform heating of the siste siab is essential. The coll can be easily made of ¼ inch from gas piping screwed into Ushaped east from connectors, as iquing screwed into Usinged east from connectors, as shown in Fig. 2. The slati slab can be covered with black olicioth and made scrivetty level. The following crock solutions must be made up and carefully fillered through absorbent collan ready for use

Slock Solution A - Nitrate of silver 3 oun tilled water 10 onness strong water ammonia 12% onness. This solution must be stirred well and allowed to stand five or six hours, then add to onness. e of distilled water and titler

Block Solution it—Restricts saits 4 ounces, distilled unfor 20 ounces

Stock Solution 1' Distilled water 40 ounces, protochioride of the 5 gratus

Ctean the glass plate or plates whitevery time rouge and water laking our tind on trace of grouse whatso ever comes into contact with the glass or the cloths or chamois leather used for polishing. When channed the plate must be flooded all over with the the solution Pour this solution on and wash the plate well with district water Lax the plate we take up upon the table with four clean wood wedges at ante corner Let the gloss cost me the wedges as as to allow a slight adjustment. It resulted for leveling. The intx ture for silvering is made up as follows

Distilled water 20 outces stock solution B is The glass plate being quits fevel and still well pour this mixture carefully and slowly upon the cen ter it will flow comby all over until it strads about one-eighth of an toch deep att over the plate. Any tendence in run to one end must be rectified by the The plate now being completely covered with the silvering infaire must be left to the if for about two hours the heat being kept up during this line and when it is found that the whole of the silver has satted the liquid must be poured off by tilting and allowed to run into a stoneway, crock and saved Scientific American

for the waste silver it contains. If it is desired to for the waste silver it contains. If it is desired to increase the thickness of the deposit of silver, the op-eration must be repeated as soon as the silvering is complete, wash the plate well in a soft stream of runstand it cornerwise to drain and When dry the following protective varnish must be used as a coating to preject the deposited silver. Shell iac. % pound, wood slephol, 6 pints. As soon as this iac, ½ pound, wood alcohol, 6 joints As soon as this conting itse first it must be paint; dower again with the following paint. Red lend ½ pound, white lead, ½ pound, instead with second holid oil and a small quantity of turns all no to take a good to sering with a single conting. A small quantity of gold size must also be dided to insure quick drying and a tough adhering quality. The mirror is now ready for framing if much work has to be done, it will be advisable to cover the siste all over with a piece of felt, and keep the felt wet during the operation for two reasons plate, and secondly, the heat from the state slab to communicated to the glass better than from a dry sur-

regular workshop a vory go fort with a guiter cut around the slab, so that the spent silvering liquid out run from the tilted plate, spent survering inputs on run from the fitted paids, around the table and be collected by renaling through a hole at one owner in this case the liquid will be sume that one incented with the felt. This will prove of no consequence because in time it will become asterizated with silver, which will realize twenty times its first cost when sent to the silver reflere, and not only my for a new felt covering, but increase the size of the pocket book at the same time. The quantity of nitrate of silver required to cost a square foot of glass with a moderate roating of silver is 18 grains. An estimate as to cost can be made from this amount

SELENIUM ORLL WITH CONTACT BY PREMURE

The usual method of making a scienium cell con wisis in pressing the electrodes against a please of electric current, when submitted to the action of the The quality of selenium can be perfectly con light The quality of scientum can be perfectly con-teiled, as it needs not come in contact with metal when fluid in which state it dissolves nearly all metals (1 c, the electrodes). This is of importance, because small quantities of other clomonia sometimes have considerable influence on its sensitivoness. More over a piece of seienium, that for some reason has lost list efficiency, can be exally replaced by another piece, at low cost. The most important point, however, is that the contraction or decrease in volume (6 to 8 per cent), which is inexperable from the process of crystallization, has no influence whatever upon the act with the electrodes, as the close of selenium is



SELECTOR CELL WITH CONTACT BY PRESSURE.

given lis definite form after the contraction has tak place Strong currents of short duration do not lead to the destruction of the cell, as there is full scope for expansion

Despite these important facts, this method has not Despito these important facts, this method has not been litherto twed bes ause very this plates of solen inm are necessary as the action of light is limited to an extremely thin layer of the exposed surface (rai-culated by Marc to be about 1/500,000 Inch thick) Noreover, selenium is rather fragile and being of high resistance beavy pressure must be used in order to realize good co

The author discovered that selenium, when molten The author discovered that selenium, when motion between a cold and a very bet glass plate, strongly adheres to the latter, after the crystallisation. It is thus peasible to cover a thin (1/260 inch) finishing glass plate with an exceedingly thin conting of selenium (1/1/000 to 1/20/000 linch) which has a highly polished surface that gives very good contact with the electrodes. These consist of gill stripes on a glass plate (Fig. 1). There are from 250 to 2,500 electrodes. on every inch

Cells constructed after this method are very reliable and show remarkable constancy. They are of small specific working surface. The following is a description of a cell actually made

Working anriace = 14 by 14 inch Roulstance in the dark = 20,000 chms.

Resistance in ordinary daylight == 10,000 chms. Resistance in strong fight == 3,000 chms. Maximum intensity of current == 0 0018 ampers Fig 2 gives a diagram of the cell.

Fig. 2 gives a diagram of the cell. Fig. 3 is an end view of same Glass plates with a thin coating of metal (silver) have before now been used as electrodes for substances sensitive to light This combination or at least the uits sitained are n

SOW & SCIENTIFIC AMERICANE

The Condic and the Faunti-make a person to ex-tinguish a lighted candle, two feet distant from his mouth, by hlowing through a common tin tunnel with his lips applied to the stem A knoot (rowtalshy, he will fall to accomplish the feet, although he could easily fall to accomplish the fest, although he could easily have bleven out the earsile without saing the funnel New past year own mouth to the stem of the funnel and bleve out the earsile. If you have any skill in per forming triks you can rupest this one many times without betraying its secret to the average speciator. The secret is this when you allow into the small of the room, and not not have you also the room of the room of the room of the room. And not not have the saint was the restriction of the room, and not not have the saint was the restriction. end or a runner, your neath rollows he half, but produces of the cone, and not only ahuse the axis, but produces eddles of such a character that there is actually a slight back draft or inward current at the center of the wide mouth of the runnel You, therefore, held the



RIGHT AND WRONG WAY OF BLOWING OUT A CAMBLE.

funnel so that some part of its conical surface would, runnel so that some part of its conical surface would, is estended, strike the canded fame. An inaxprelenced person naturally directs the sain of the funnel toward the sain of the stand of the sain of the stands of the sain of the stands of the saint of the stands of the saint of the saint

Billing it with tobacce smoke Paradozes of Subillion.—Everybody knows that water boils at the temperature of 215 dag Fahr But if an uncorrived bottle partly filled with water is set in a saucepan containing water in which a good deal of any that the saucepan containing water in which a good deal of any that the saucepan containing water in the bottle will been to boil while the water coulds at the pressure prospirit lamp or etherwise, the water in the bottle will begin to boll while the water outside still remains perbegin to boll while the water outside still remains per-cetly quiet. Yet the water outside must be at least as hot as the water inside (313 dag Fahr), for the latter is heated by the former Hence was see that water which centains sait in solution does not boil at 312 dag. Fahr The same effect is produced by dissorting any other solidembatance in the water

other solidambetance in the water Now, if the bottle is taken from the hot brins and corked, the water in the bottle stops boiling, but it will boil again, even after it has cooled many degrees, if cold water is poured on the upper part of the bottle. The explanation is that the boiling point or water is affected by pressure. It is about 312 dag. Pair under the ordinary pressure of the atmosphere (exactly 313 the orumary pressure of the atmosphere (exacuty 212 deg when the barometer stands at 20 juckes) hat if the pressure is reduced, water boils at a lower tem perature. When the water bottle was corked and taken from the fire, its upper part was filled with steam at atmospheric pressure, which had expelled the steam at atmospheric pressure, which had appelled the air originally present. As the bottle cooled, this steam partly condensed and its pressure was diminished, has not sufficiently to permit the water to boil, because the water cooled aiso and its gradually diminishing temperature was always a little below the building point corresponding to the actual pressure. But the application of the coil water caused a rapid conden-sation of steam and a sudden lowering of the pressure. without having much cooling effect on the water, which equently began to boti.

consequently began to boil. Distillation "The same apparatus may be employed to illustrate the process of distillation." The brine in the pan is replaced by fresh water, a belie is borred in the cork and a giase tube is fitted to the hole. The water in the bottle is added one-lenth its volume of atroolo, or less. The bottle and pas are placed over the lamp, as before, and bested gently "Before the water in the pas has resched the boiling solat the vagor of the more volatile slooked (mixing with a lib-

the water vapor) issues from the end of the glass tube, where its presence can be detected by its oder or by the application of a lighted match, which will result in the production of a call blue fanne. The fet should not be lighted until the mixture has been heated long enough to angel the air from the bottle, as the ignition of a mixture of air and alcohol would produce a Victoriest explosion. For this reason the corft, though it sent explosion. For this reason the cork, though it should be air-tight, should not be inserted too tightly With this precaution an explosion will drive out the cork, instead of shattering the bottle. This experi-ment, and the others performed with this apparatus, should not be attempted by children or careless per-

sons.

Hero's Fountain.—If the jet of films insuing for
the tube is extinguished and the tube pushed do
nntil it dips into the water, a fine liquid stream w



MODIFIED TORM OF WHICH WOUNTAIN

be thrown high in the air by the pressure of the mixed vapors of sloohel and water in the upper part of the bottle.—Kosmos.

A SIMPLE REFECTIVE FILTER.

The filter here described was first made by the writer The filter here described was first made by the writer in 1878, and used originally for filtering guitaline smulsions. As a water filter it is both simple and effective Procure as ordinary kerosens larap chimney Fit over the ond of it two or three thicknesses of washed cheese cloth Press a tuff of absorbent cotton into the small part of the neck for about three luches in depth, in



HOME-WARR PILTER.

the chimney, and place it in a hole cut in a wooden shelf as a support. Pour the water in until the filter is filled, when it will be observed that any enganic matter, chips of iron rust, etc., will be rotained by the cotton The fine organic matter may penetrate the cotton for about one lack, but no farther The resultant filtered water will be bright, clean, and pure

ant filtered water will be bright, clean, and pare

A paper dealing with "Research on Metallic Filament
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OTHER WORLDS IN SPACE

(Continued from page 169)
graph is being taken. A careful obse
with such an accurate instrument wath such an accurate instrument will obtain the spectrum of the star in the middle of the photograph fanked on alther side by the spectrum of the metal iron or titanium or the gas hydrogen. placed there by the use of the electric convent and induction coll Astronomers use different metals for the purpose of comparison, the Yerkes Observatory, for instance, employs both iron and titanium on the same plate
A good photographic spectrum will the

consist of that of the star to be investi-gated, supplemented by the lines of the comparison spectrum How are these spectrograms to be interpreted? And how can they tell us anything about stellar motions? Remembering that light is a wave motion, we have a simple analogy in the case of sound, and one with which everyone is familiar. In traveling in an express train which passes another going in the opposite direction, we have all of us noticed that the pitch or tone of the whistle or bell of the other engine suddenly drops as it passes by us. The res-son is that sound is also a wave motion (though the waves are much different from those which cause light) and the quickly approaching engine causes more waves to crowd into our ears each second of time than it does when the engines are not moving. As the tone is determined by the number of waves which fall on the ear drum every second, the consequence is that the pitch of the whistle or bell is raised while the two irains are approach ing, and for the same reason it is lowered when the two after passing are going away from each other. The change in the of the whistle depends on the spec of the two trains and also on the velocity

of the two trains and also on the velocity of sound and as these are comparable, a divided change in tone is readily noticed Applying the same ideas to light we have what is known in science as the de ided change in tone is readily noticed with happing the same ideas to light we have what is known in science as the beautiful to the same in the sa the star is oppositing the earth, a shift below and the rear end of the spectrum signal place. The star is opposition that star and earth are separating from each other A measure of the shift and star is star in miles per

The calculation of these velocities in section of the section of t The refinements of present day work are seen as a consistent of the consistent day work are seen as a consistent day work are seen as a consistent day and the lake (Descriptor, than to any seen as a consistent day and the seen and the lake (Descriptor, than to any seen as the lake of the lake (Descriptor, than to any seen as the lake of the lake (Descriptor, than the lake of The refinements of present day work are





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rely Business Men are not All Bad—You Think?

With the Customs Service debauched by the big importers, with the tanif forced up by the big manufacturers, with our national resources looted by the financial paratos, do you sometimes wonder

Do you sometimes feel that the paston-building problem will nove settled by sentemental reformers? Sometimes Does Your Head Just Ache with it All?

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One Thoughtful Man has Solve the Problem.

worked his way through the tangle exting all America, and has found the treth.
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(Continued from page 170)

some faint stranks of light about two inches long and possibly one sixteenth of an inch in width. His tells the whole story of the stars mother \aturally one for exemination and there it as croscope for examination and there is an pears magnified and is measured. The physical constitution of the Star the metals that compose it is known from the three of the stellar spectrum hydrogen. three of the stellar spectrum hydrogen, for lustance showing its hadge by a series of prominent lines. The motion of the star is shown by the placing of these lines, whether they are skilled from llines, whether they are skilled from their normal position as kiven by the comparison spectrum to the violet or toward the rol end of the spectrum. If there is hydrogen in the star lies the lliues of the hydrogen comparison spec-trum give the position of rest or sero volotity with respect to the earth, and the amount of the shift measured other the microscope gives the motion of the star. If there are other lines in the specfrum of the star las is usually the case) we can readily in an analogous fashion measure the motion. The photographs in the illustration were taken at the Yerkes the littlatration were taken at the Yerkes Observatory with the great 40-inch tele-scope. Two separate spectra are there shown taken but three days apart on Junuary 5th and 5th 1966. The star speclring appears in each between the com-parison spectrum of litudium and it is widened to make the lines more promi-nent and the whole greatly enlarged. The violet and is toward the left, red end to the right Purtions of the comparison spectra on both are cut away in bring the two closer. The munibers on the top give the wavelengths. Notice that all the lines in the lower spectrum are shift. to the comparison lines than in the unper spectrum This is specially noticeable at line 4501 and better still at 4481 A measure of the amount of these shifts gives the radial velocity of the size respect to line earth. The variable ve-locity in the line of sight of this star shows it is not a single star but a system Measures made by the writer on the star β Trianguil show the following results whore the radial velocities are given in miles per second relative to the sun. The plus sign means that the star is increasing its distance from the sun and a minus sign that it is moving toward the

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+ 18 miles per second The measures must be carried out with The measures must be carried out with nitroes care. If the spectrum of the state is good with many well defined lines, the radial winting it of the carrier was made with the carrier was made with the carrier of one-to nit in a mill per second Thinks of this wice light trive is at the rate of the carrier of metal was a second when with number of millions of allillons of was well as the carrier of 186,000 miles per second when six humber of millions of allillons of was well as the carrier of the ca enter the spectroscope every seeind and when in addition the star is so far dis taid that its light even when traveling hundreds or thousands of years to reach nundreds or innusands of years to reach us. To contemplate it makes our minds whire at the controlly of space and causes us to low down in recrence to the conderful launen intellect that can solve such molderns'

investigations of certain stars show us that at one time it may be moving toward our sun once in a few days or weeks the direction of motion may be reversed and it is traveling away from the sun. The so that variable velocities in the line of sight as in \$\beta\$ Trianguil denote that two or more suns are present to tion, and another body must be present or more sums are present in a system and they are in revolution about each other At our distance from the stars the (Concluded on page 172)

late J W Matthews Sale II W Mired Sale apring II L 1 beneal Comment of the commen 144, 007 148, 801 148, 604 148, 791 148, 791 148, 165 148, 643 148 148 700 914 945 144 541 154 450 154 411 154 650 154 118 154 658 154 658 154 658 154 658 154 658 945,470 945,470 918 437 948 967 948 998 918 524 1148 906 148 906 lines that total timelities are fined as it has a line including a saw for disab as it has a line including a saw for disab as it has a line including a line in the line including a line in 045 707 848 121 848 768 818 768 818 768 948 769 948 779 948 774 948 774 948 774 948 774 allocations drying of perforation h activation of mailer for installer composition of mailer for it that the composition of mailer for it the composition of mailer for perform perform the composition of 91K T31 Compared and Secretary and Sec fercier imagencial F I Awhill 1468,754 p societ, incatelescal R R Miller release 948 681 P48 414 P48 414 P48 440 P48 380 P48 380 "Foretrially superation is a second of the control to garma touring the second of or read-other and read of the stall muchan unchan larger in Neuera Sand Maria Sand Ma

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arataly, and hence we have a compara-tively new class of stars, these which ap-pear as single even in the most powerful telescopes, but whose motions in the spec-troscope show that they are really double suns. These are called spectroscopic binaries. Recent researches at the Observatory, Terkes Observatory binaries. Recent researches at the Lick Observatory, Terkse Observatory and other places bring to our knowledge most starting results. Imagine two sune each many times more massive than our own, rapidly revolving about each other in a few hours! In addition to this comes the fact that at least one in every few store so for investigated turns out to be stars so far investigated turns out to be not a single star but a system, and it has become necessary to reconstruct our ideas regarding the importance in the universe of this small ball which we call Mother Earth.

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Highly specialised intor in constant, and this menace increases as the age of the worker advances. Under the fierce competition (Continued on page 172.)





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(Continued from page 171) which governs the greater portion of our industrial life, new processes, new meth-ods, short cuts, labor-saving devices, new entions, are all engerly sought by the inventions, are all eagerly sought by the employer of labor. Some of these are revolutionary in their effects. They call for a radjustment of the whole plant When that readjustment comes, the older men are invariably dropped. In short, the avenues which lead to employment, for all highly specialized labor, are pracfor all nightly specialized labor, are prac-tically open now only to youth. The middle-aged man enters with difficulty and the man past middle life substan-tially cannot enter at all. The man who did many things, none of them highly similared from twenty to sixty five likely never to become entirely dependent upon society. The man who did some highly specialized piece of work which involved only a part of some specific ihing, or even a part of a part, may be forced into the dependent class before he reaches old age, and when he joins that class he is much more helpless than the came no is niute more neighbors than the man who has done many things. It is probable that the specialist, ultingle he labored fewer years, rendered society the more valuable service of the two, and that therefore he has, morally at least, a that therefore he has, morally at least, a clearer title to consideration. But how-ever that may be, he is the inevitable product of the whole plan of society and business, and the obligation of the man who employs him and the interest of general society in what finally becomes of him, are clear and unavoidable. That itself against the menace which it con stantly faces or that it must be help outright after disaster or age come a ompelling facts in the sociology of the

There can be no question that a system which teaches these people how to pro-tect themselves against this menace, i more in harmony with the genius of our institutions than a system which coerces thom into action or a system which final ly places the burden of their support and rare upon general society. It does not follow that a system which works well in Germany would work well here, or that a system which appeals to the needs of the people of Great Britain will answer here. There are distinct advantages in the German plan,—chiefly that it is com-pulsory and that the laborer is forced to make provision for certain benefits even though he may have no very intelligent though he may have no very interingent understanding of the wisdom of the plan or its effects on society. There is n dif-ference between the compulsion of gov wrmment, which tells the workingman that rertain things must be done, and the proposition of a corporation which tells a man what the conditions of his hiring

If the conditions named by the om player involve some system of life insur-ance some system of deferred annuities, a man can simiy the question and luke a position or leave it since because it rec onmends like if to his budgment or piler wise This is a slower process than the German method and probably for a good German method and probably for a good many years will be more expensive, but it seems to me to be in harmony with our notions of individual responsibility and the rights as well as the obligations of Ametican citiz nahip

The efficient omployee, in specialized labor, has a fair claim to something be youd the returns contained in the ord eary contract of hiring This right may be strengthened and its realization vanced, but it cumou directly be met, in this country, by governmental action The capable worker deserves and should demand a programme of hiring under which he shall be entitled—and entitled by contract not by the grace of his om ployer—to certain protection for his fum ily if he dies prematurely, and to certain protection for himself if in the vicinsitudes of industrial war he is shelved and pendent class

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tons should avail themselves in rork of the highly developed system insurance and amustics presented by the responsible insurance institutions of this and of other States. Any effective sys-tem if established by corporations indetem if established by corporations inde-pendently, will be based on the principles and methods used by the insurance com-panies, and therefore the work for ob-vious reasons is in the end likely to be more effectively and more economically more effectively and more economicaty done by men who are experts and spe-cialists than by men who undertake it with no special training and with minds chiefly occupied by the demands of other lines of work

(Concluded from same 173)

I shall therefore assume that life ini shall therefore assume that life in-surrance, and probably other types of in-surance including accident and sickness insurance, as represented by existing cor-porations is not only well equipped to help in the solution of this problem, but is a part of the evolution of the times which has produced the problem itself, and is another illustration of the curious fact that in the processes of evoluti olution of a problem often appears at solution of a problem often appears at the same time the problem itself is evolved For example, what might have abspected in the unermost industrial activity of the l'alled States and its unceasary output of securities seeking purchasers if millions of people combin-ing their mails awings in the reserves of the great tife insurance companies had not appeared upon the scene contempo not appeared upon the some contemporareously seeking securities in which to invest their money? The function of its lasurance and of other types of insurance on the one hand and the obligation of the employer of labor to his omployees on the other, bear, it seem to me, an identical relation

identical relation
Life insurance is air-eady effectively at
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idea or appreciated its beneficente, proreas has been made toward the solution
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bys Formed by the Co Metal Powder

The ordinary method of preparing alloys consists in melting two or more metals together, and allowing the melt to metan topecans, and anowing the men to crystallize after cooling. Can not the same alloys be obtained by compressing the component metals at ordinary tem-peratures in the shape of fine powders? Dr W Spring showed as far back as 1882 that under a pressure of 5,000 atmospheres the powders of the constituents of the Rose and Wood alloys will form of the Rose and Wood alloys will form conglomerates, the melting points of which nearly coincide with those of the alloys obtained by melting in 1888 Hal-look showed that by mersiy uniting at or dinary pressures the powders of the same constituents there is obtained a mixture (Concluded on page 176.)

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(Concluded from page 174.)

melting at a lower temperature than the melting point of the most fusible component By compressing sine and coppe powders, Spring obtained a conglomerat which was distinguished from brass only

which was distinguished from brass only by its slightly darker color In spite of these partial results the problem had not so far been definitely solved It remained in fact to be seen whether, by sugmenting the speed of fusion of the mixed metal powders, pressure reguly favors the formation of those ure really favors the formation of those compounds which are characteristic of siloys obtained by meiting. This quee-tion is answered by Prof. G. Tammann on the basis of recent experiments by G.

Masing

When submitting a mixture of filings

when submitting a mixture of filings of two metals forming neither a chemical compound nor mixed crystais (c g , xinc and cadmium or copper and silver) to a pressure of 4 000 atmospheres, and heat ing the conglomerate thus obtained the rising curve of temperatures is seen at a given point to slacken down after reath-ing a temperature 1014 deg C higher than that at which the whole is found to As far as its thermal properties meit. As far as its thermal properties and its structure are considered this conglomerate is practically identical with siloys obtained by meiting

Again by compressing under high pressure the powders of two metals form pressure the powers of two means forming a definite compound and capable of mixing in sil proportions in a liquid cou dition and by heating the conglomerate thus obtained, two stopping points arr found in the curve of temperature. The first of these points corresponds with the melting of a compound formed at the sur face while the other corresponds with the for instance, with mixtures of magnesium with zinc lead tin or bismuth. The con-glomorate composed of magnesium and stomerate composed of magnesium and autiniony has only a single stopping point situated at 300 deg C below the melting point of antimony This corresponds with the formation of the compound

Mg,8b,
The temperature then rises very rapidly in order to eventually fail down to the melting point of the alloy The to the conglomerate of two metals form lot the conglomerate of two metals furn-ing an untherrupted arise of mixed crystals, such as magnesium and ead mium on the one hand and lead and thal ilum on the other When heating such conglomerate only a single stopping uniat is observed corresponding to the melting point of the most cusible com-ponent The form then assumed by the curve depends on the diffusion of the

curve depends on the direction of the two components into one another.

The conglomerates obtained merely by compression do not contain any frate of mixed crystals. Microscopical examina tion thus only shows the existence of tion thus only shows the existence of grains of copper and tin in recently pre-pared conglomerates II, however these mixtures be heated to 200 deg C (i e, below the melting point of the tin) there below the melting point of the tin) there are found between the grains of copper and tin, two layers corresponding to the compounds Cu,8n and Cu8n respectively if these conglomerates be hosted during 20 hours to 400 day a layer of mixed crystals, corresponding to the formula Cu,Sn, la found This proves that com-pounds of these metals are permeable to

their constituents.

The following conclusions are derived

The compression of two metals at ordi nary temperatures will yield conglomer-ates containing only the pure metal i e neither compounds nor mixed crystals as characteristic of alloys obtained by melt ing. Mere compression thus does not activate diffusion sufficiently to bring about combination or the formation of mixed crystals If, however, heated met-als (1 e., with increased speed of diffu-ation) are submitted to pressure there is obtained not only a more coherent mass, but a portion of the metals is found to form compounds and mixed crystals, so as to produce a conglowerste which is very much life a real alloy mixed crystals If, however, heated m

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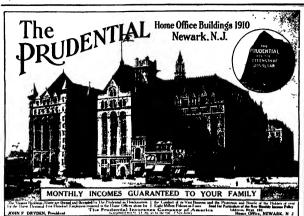
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Vol. (II No. 9] NIW YOLK II BRUALY 191 | *** 18 *** 11 **** 191



involved self acting incline on the Cothin Forest Railway. The reivy pens op e00 of ar is fat actly v isable i artino at inter-A LOGGING RAILWAY TERFORE THE COCKIS SUFER ROUTE INDIA —(No. page 184]

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or is always gird to receive for examination illustrated article of timely interest. If the photographs are sharp the article the facts realisative the contributions will receive specific Accessed articles will be paid for a regular space rates

THE COMMISSIONER OF PATERTS' ANNUAL REPORT

HE annual report of the Commissioner of Patents Hon Edward B Moore, for the fiscal year ending June 10th, 1909, has recently been published and contains several useful suggestions for the improvement of the office of value to inventors and patentees

Hefurring in the work of the office, he says

There were received in the last fiscal year 62 800 applications for mechanical patents 1 186 applications for designs, 192 applications for retasues 2 052 caveats 7,509 applications for trade-marks, t,00t applications for jabels and 38 applications for prints. There were for most and its applications for prices lines were for 152 fig patents granted including resums and designs and 647 trude marks, 770 labels, and 211 prints were registered. The number of patents that express which were by operation of tew forfeited for nonpayment of the final fore, was 6,763.

the final fore, was 6,763
"The applications for patents for inventions have increased over last year by between 4,000 and 5,000 and 5,00

ich became effective July 1st, 1909, repealed th act approved June 18th, 1874, under section 3 of which labels and prints have been registered in the Patent Office Consequently no certificates of registration of labels or prints have been issued since July 1st, 1909, except those evidencing registrations effected on or be-fore June 30th, 1909

"The money receipts from all sources were \$1,975,-919 97, and the expenditures \$1,887,443.35, leaving a net surplus of receipts over expenditures of \$88,476 62 The grand total of receipts over expenditures for main ling the bureau from 1836 to date is now \$7,0 This vast sum represents the earnings of the Patent Office, and the bureau is therefore more than setf-anpporting '

Owing to his success in securing additional appro-priations from Congress in 1908, the salaries of the priations from Congress in 1908, the salaries of the examining corps were increased on July ist of that year, resulting in a noted decrease in the annual resignations. Owing to the additional force he was authorized to equiply and the releasing of the shiftled examiners, the work in nearly all of the examining divisions of the office is practically current. He aims to keep the work current in all branches of the office, if possible, which is certainly a most inudable pagpose, and one that should be carefully considered by Congress He says

The restd increase in the number of application filed and the constantly increasing field of search om-bracing as it does not only United States and foreign patents, but also publications of every character, make it imperative that edditional force be provided each

year to prevent accumulation of the work."

He has asked for one new principal examiner and twenty additional examiners to further the work of tassification of patents. There are now 930,000 United States patents, approximately half of which have been rectanded Over 2,000,000 foreign patents and nearly 90,000 volumes of the scientific library remain

The models formerly stored in the basement and on the first floor of the Patent Office building have been moved to another fireproof warehouse a short

Additional space for the storage of new volumes of foreign patents by at least 150 linear feet per an num should be provided for in the office library. An

appropriation of \$2,000 for this purpose, which it is thought will be sufficient for a period of five years, is habrame

The space aveilable for the storage of printed ek The space available for the storage of printed classic decipies of patents is becoming crowded and the ercommodations in the attoracy's and public search room are becoming insufficient for the work done there. One of the long hallways that has been see apart for this purpose is in a competed condition and is inadequate for the purpose flows changes to fifted the purpose of the competed of the purpose of t ent on three sides to conform to that of the Ninth Street front

Ninth street from ile believes that the time has arrived when meas-ures should be taken to secure the construction of a new larger huliding in which ample room will be sflorded to properly and promptly tran-ness of the office. He says particularly

ness of the office He says particularly
"It is necessary that patents for new inventions
should be issued with the utmost promptness efter the
application for patent has been filed for such inventions form the basis of vast industries, which inure not merely to the profit of the inventor, but to the benefit of the manufacturer the inborer, the trader, the professional man, and the consumer, and to the comme and Germeny have each recognized the necessity of providing ample facilities for the work of their patent providing ample racinities for the work of new buildings for their patent offices, which are in every way more commodious and better adapted for the business of a patent office than the building which now houses the United States Patent Office, although the patent bust ness of cash of those countries is small pared with that transacted in the United States Patent

He urges that the new building be located near He urgest that the new nutting be overseen mean-the Congressional Library on a square north of that building as embodied in Senate bill No 3,564, intro-duced by Senator Daniel, Jenuary 24th 1898. The surplus to the credit of the Patent Office in the Treasury Department of \$7,060,547 he thinks would go far

ary Department of \$7,000,047 he thinks wound go lar toward paying the expense of the building. As to future desired legislation he continues his recommendation in previous reports by advocating an amendment to the statute which has for its object the shortening the course of appeals from the primary examiner (in : park cesse) to the board of examiners in chief and the Commissioner by combining the board is chief and the Commissioner by combining the board of examinary, to their with the Commissioner of Patents and his first and second assistants into a single ribunal, any three of whom shall constitute a quorum, to which all appeals shall lie, whether from a primary caminer or trom the examiner in interference and from which appeals would lie to the Court of Appeals of the District of Columbia The elimination of one appeal, he states, well materially shorters the lines and effect a considerable swing of expense to applicants we believe there is much merit in this recommendation and trust it may receive have only accommendation and trust it may receive have revise considerable consider mendation and trust it may receive favorable consid-

A further additional provision recommended is the amending of section 4 889 of the patent law by re-quiring to be filed with the drawing two photographic One of the photo raples thereof with the application. One of the photographic copies is to be kept in the file wrapper and the graphic copies is to be kept in the file wrapper and the other is to be filed in secret archives in charge of the chief draughtsman while the drawing itself will be kept constantly in the office of the examiner and will be available at all times for imspection in their re-spective divisions. He states there have been caused of trand in withdrawing and substituting other draw

of train in windowing and substituting outer university for the originals and that some such plan is needed to detect possible unauthorised changes. We think if would be more practical for the Commissioner to have the negatives made of the drawing at the time the application is filed, and withhold the delivery of the filing receipt until the official photo-grapher had certified the photograph as being an

exact reproduction of the drawing

The Commissioner advocates the formati "patent ber." and suggests before an individual be permitted to practise before the Patent Office he will be required to pass an examination as to his moral legal, and technical qualifications before a committe regs., was excessed quantifications secrets a committee appointed by the Commissioner of Patents, composed of officials of the office and patent stormays of well-known standing in the profession, who shall conduct the examination under the direction of the Commis-sioner. The report of the committee is to be subject to his approval. This suggestion appears to us to be very approval. very appropriate

in regard to the amendment and improvement of treaties with other countries concerning industrial property, it is proper to say Commissioner More has been most ancesated in securing advantages for Amer-ican inventors. He says on this subject

ican investors. He says on this subject "I am gratified to report that during the last year a treaty was negotiated with Germany, which confers great benefits upon the American inventor The patent laws of nearly all the foreign countries contain a

cleans providing that it as invention is not that it, manufactured or practiced—to such country within a certain period, ranging from two to four years, the patent may be annulled. This treaty with formany months of the provided that the provided any provides that the working of a patent in one Germany provides that the working of a patent in one of the contracting countries will have the same force and effect, so far as avoiding the revocation of the patent is concerned, as if it had been worked in the country in which the patent was granted This treaty country in which the patent was granted This treaty, has practically assured to American inventors the pro-tection of their rights in Germany during the full period for which the German patent is issued, con tingent only on the working of the invention in one of the two countries

Prostate of the

"It is understood that Sweden has modified its laws to extend similar protection to other countries which do not require the working of the invention within a specified period, and negotiations are now pending with nearly all the European states for the promulgation of treaties of the same character. In order to sasist in the negotiations of these treaties, I have been delegated by the Department of State and with your delegated by the Department of State, and with your permission I shall visit the capitals of several foreign nations to assist, so far as within my power, in the regotiations of such treaties, which if concinded will regotiations of such treaties, which if continued will greatly extend the protection of inventors, manufactur-ers, and the industrial interests of this country, as well as those of the nations with whom such arrangements may be made."

ates the next International Convention for the Protection of Industrial Property is to be held at Washington, D C, in May, 1911 About this he is most sanguine and esthusiastic. He save

meeting of this convention is most important to the interests of the American inventors and manu to the interests of the American juvantors and manu-facturers. The 21 nations which are athermats to this union will be represented by delegates having full power to negotiets agreements in respect to the re-ctiprocal protection of patents, designs, trade-marks, and industrial models, which when ratified by their respective governments will have the force of treaties. The efforts of these conventions in the past have it reriprocal protection of patents and trade-marks having been ratified by all adherents, which comprise the leading commercial nations of the world and the Congress of the United States has in each instance as ed the patent laws of this country to accord with the terms of the international agreements concluded at

Not only are the members of the union reby delegates but all other civilized nations, not mem-bers of the union, are invited to send representatives in the interest of furthering the reciprocal protection in the interest or urracering the reciprocal protection of industrial property. It is expected that at this com-ing convention a strong effort will be made to har-monise the laws relating to patents and trade-marks throughout all countries in such a manner that adethroughout all countries in such a manner that ade quate protection will be given to an inventor, no man quate inretection will be given to an inventor, no mat-ter of what country he may be a citisae, without the necessity of obtaining expensive patents in such of the several countries in which his invention may be used or sold it is also proposed to perfect and extand the international registration of trade-marks and thus cruther the reploymed protection of commercial indus-

THE ALL-STREE CAR THE CAR OF THE PUTURE

OR many years past the Scientrific American has etrongly advocated, on grounds of public health and safety, the building of all-steel health and sastey, the building of altieute cars for railroad service, and we are there-fore much gratified to learn that the Pennsylvania Railroad Company is adding to the stele-are equipment at a rate which promises, before many years, to clini-uate the present wooden ext, and provide that great system with an all-steel passenger car equipment it was as on August 12th, 1964, that that railroad an-neanced that all future passenger sulprouch quoid be halt of size and that the design would be such as to balli or steel and that the design would be such as to render it indestructible either by collision or fire. In planning the cars and establishing those standard types which are now being copied in all the new equip-ment, no expense has been spared to build a concl-which should provide the greatest possible strength, and finish it with an inside lining that should be a soluted to more than the standard of the which should province can greatest possions account.

and finish it will am inside birting that should be absolutely subtranshe safe possess the added and not inconsiderable safe structured that it would be a poor den-dence of best and notion. The first order, placed in ductor of best and notion. The first order, placed in the canada. 10 dining care, 21 combination passenger and baggane care, 29 Baggane care, 28 postal care, and 1 company car, making a total of 134 steel care, Fer-thermore, the Pullman Company has been building for the railroad during the part four years getter all-steel parter and sheeping care. About 500 of these will shortly be placed in service With the present steal equipment and some 250 care to be ordered during the present year, the Pennagivania railroad will in a short with law ten service 800 of the own steal passenger care and about 500 ottos Pullman care.

Scientific American engineering.

In a paper recently read by Mr Henry Heas before to American Society of Mechanical Engineers on the swer lost in belting, it was shown that 90 per cent the An power jost in centurg, it was snown that so per cent of the power transmission lost was due to journal friction. This may be materially reduced by substi-tution of ball for plain bearings, provided care be taken to sait the size of the balls to the load.

mittee of the American Railway Mainten ance-of-way Association in a recent bulletin takes up the subject of rail specifications For Bessemer rails of \$5 to 100 ibs. it recommends the following composiof 80 to 100 IM. It recommends the following composi-tion Carbon, 46 to 0.55, managanese, 68 to 115, phosphorus not to exceed 0.10, and sulphur not to exceed 0.075. The recommendations for open-hearth state for the same waight of rail, carbon, 0.88 to 0.75, managanese. 0.78 to 1.00, phosphorus not to exceed 0.04, and sulphur not to exceed 0.06

The two latest German dreadnoughts are to be equipped with turbinos, and special interest attaches equipped with turbinos, and special interest attaches to the fact that two rival types of unriline, the Parsons and the Curtis, will be tried out against each other The "itelmdal" will be propelled by triple screws op-erated by Curtis turbinos, and the slater ship will be equipped with Parsons tunbines of equal contract

A method of simultaneously excavating and lin-ing vertical shafts is contemplated in one of the con tracts for the Catskill water supply In the In the shaft concrete forms will be erected and concrete iaid. The excavating will be carried on below, the material be-ing hoisted through a hole in the center of the plat

Wa recently noted in these columns the rapid is rease in the weight of iccomotives. A similar growth is taking place in the cars, the Pennsylvania Rati-road Co having recently asked for tenders for 10,000 coal cars of 70 tons capacity and an overload capacity of 10 per cent. As the sued in the cars will weigh 20 tons exclusive of the wheels, the maximum weight of car and load may reach 100 toas

Apropse of marine turbines we note that Mesars Parsons & Co., recognizing the advantages of twin-serew propulsion, as proved in the Curits equipment of the arout "Salem," have developed a modified Cur-tic partial admission turbine which they are to install in one of the new \$ 200-ton 26-knot British secouts. A sister ship will have Curtis turbines. The Parso turbines will weigh 340 tons, and guarantee for power on 13 pounds of dry steam per horse-power per hour The Curtis turbine will weigh 250 tons and guar-antee 125 pounds of superheated steam

There are persistent reports that the Hamburg American Line is about to build two bugs steamers which will rival the While Star libers (Tympic and Titanic, which are to be in service during 1911 The reported dimensions are Longth, 850 feet, been, feet, and depth 65 feet Reciprocating engines of will drive the ships at a sp

A recent bulletin of the United States Geo Survey gives some statistics of producer-gas power plants in the United States which are vary favorable There are over 500 plants in operation, aggregating 115,000 horse-power The government testing plants 115,000 horse-power The government testing plants at St. Lonis and Norfolk show a fuel consumption of as low, under favorable conditions, as 0 95 pound per electrical horse-power Comparative tests of 75 grades of bituminous coal under steam bollers and in producers show a ratio of 2.7 in favor of the latter

One of the most important branches of the general scheme for the development of Japan is the extension of her railroad development along predeterm of her railroad development along predetermined lines which have been laid out with an eye to the descriptment of the country considered as a unit A notable swant in this development was the recent complete of the railway between Hitovoshi and Kageshima, which connected up the last like in the trunk in running throughout the full length of the empiry. Tho total length of the into in 1700 miles, and the distance from north to south of the island can now be faced year. 1917-1908. 4431 miles and the railway more opened to traffic and 445 miles of railway contrailed by utwiss interests. trolled by private interests

trolled by private interests

A premating installation of a windmill-electric plant has recently been completed at Worcester, England, by J. G. Cullade & Co., of London: It consists of a 24-foot wind turbine carried upon a 74-foot tower, the bactery and witchboard in one of the outbuildings of the house. Overhead copper, online carry the current to the bactery some 645 years dictant. The possession are 460 to 80 revolutions per minute are wind; thus a 46 do to 80 revolutions per minute are wind; thus a 46 do to 80 revolutions per minute the wind turbine. It has a maximum output of 4 killeratiz with a neural present of 70 volta. The plant runs about 100 lights in the house, and serves also for five a other gutter, a civilage size, and a received to the content of the wind turbine. also to drive a chaff outter, a circular saw, and a re

PLECTRICAL.

A company has been formed in London to introduce and encourage the use of electricity in the poorer dis-tricts of the city. The company agrees to wire and supply any apartment of three rooms and over with supply any apertunent of three cents a week per lamp from April to September and seven cents a week for the reat of the year. The lamps however must be reed by the cons

A new mounting for metallic filament in lamps has A new mounting for metallic filament in lamps has been devised in Germany. The mounting provides for the shrinkage of the Stament which is not aways solitors, and for this reason ones in Sinners it is supported at its lower end on a small spring which is covered with a paste of flusty providend tungetes so as to prevent it from being consumed by the heat of the literadescent filaments.

of the incendescent filaments
The use of the telephone for train dispatching is
alowly apreading The Gulf, Tozas & Western Raliroad is emipping its line with a telophone system for
train dispatching between Jacksbore and Benjamin
trass. The road connects the Chicago, Rock Island &
Gulf and the Wichita Valley ruitroads
Whon the telephone system on the Bepicane division of the Great
Northern Raliksy is completed there will be 2100
miles of this ralinead operated by means of the telemiles of this ralinead operated by means of the tele-

A by electric plant in the Hakone Mor A hydro-slectric plant in the Hakono Mountains about 36 miles from Yokohama, lapan has recently been completed and is particularly interesting for the fact that much of the apparatus used is of Japanese make The Shibaura Electric Manufacturios Company of Tokio has built the 600-kilowatt air-co ersed transformors to be used at the sub-station in Yokoliania. A large number of the high tension lusulators used on the line are of the Shibaura type About one-third of the line is supported on to which is a new departure for Japan At the power which is a new departure for Japan At the power istation the water is carried over a distance of 15000 feet in two parallel plops libre that lead to the turbo-generator units. In upper laid of the plops libre con-sists of reverted plops made by the Shibanan Company Tho piant comprises two 2000-killowatt allernators and the current which is graverated at 3450 volts, is stepped up to 46,000 volts for the libre

In a recent number of the Electrical World appe an interesting article on the wireless telephone the author arrives at the following conclusions is, then quite evident that future systems of wire-less telephony must either eliminate the ose of microphone transmitters or find types for in advance microphonic transmitters or may types far in auvance of those used to-day in addition to this, some more powerful and more reliable oscillator must be substituted for the art. If no great difficulties arise in its operation and its cost be sufficiently reduced this sta operation and its cost or sums inity reduced this substitute may be the high frequency alternator. With the few weak points of the present system removed and the useful parts of the apparatus retained, the wireless telephone will come into all the uses to which it is adapted but the climination of the defects will involve a departure from present methods.
Until these are discarded, attempts at commercial vireless telephony will be futule

The following useful olevitrical shop kink was not-lished in a recent number of the Siectric Rallway Journal describing a method of soldering broken or burned-out wires without removing them from the armsture "The damaged wire is raised a little way not of the slot. The insultation in them seraped off for a few inches and the ends of the broken wire art end of smoothly after which a piece of wire is cut to fill the gap. One end of the inserted wire is then butteneded with the armsture wire and the ends heated by a gas torch must live are used to "Fron this a little color is inserted between the anna. When is color is inserted between the anna. When is consider is finered between the anna. The following useful electrical shop kink was splices are completed in this rassion the pare wire as wound with slik, as the latter takes up less space than tape. After the slik has been covered with insulation the coil is ready to be returned to the slot. During the operation of heating with the torch the adjacent wires are protected by fiber barriors"

Et is reported that at the time of the rescue of the crew of the steamship "Kontucky" by the "Alamo," which had been summoned by wireless telegraphy, the wireless apparatus had almost been put out of mission by the water that partially submerge mission by the water that partially submerged ridynams. By wraping the dynamo with tarpusing its was possible to keep the machine running until help animoned by wire-see ridegraphy, and on a previous occasion the apparatus was put out of commission by the encreachments of the water It has been suggested that storage betteries should be used to supply the current, because they could be placed where there would be no danger of injury by water where there would be no anner of injury by water But as storage batteries would be impractical owing to the motion of a vessel in a atorm, some arrange-ment should be provided for placing the dynamo and oline engine for driving it well above the danger

SCIENCE

Recent experiments have proved conclusived it will pass a 200-mest sieve, will exuteds from con tact with either a naked fisme or with the arc electric current

The hullding of an observatory on the rim of the great crater of kilauwa has been advocated for several years. The prospects are now brighter than they ever were, and it seems likely that the observa tory will be built as part of the College of Hawati

A recipe for a non-shrinking alloy to be used in duplicating patterns, is given as follows by The Metal industry Tin, 10 pounds, xinc, 50 pounds This gives a tough hard metal that runs well if a good krads of xinc is used The addition of 2 pounds of bismuth will render it even more fuld and enable it to be poured at a lower temperature. By using beavy syrues and pouring cold the shrinkage which is slight, may be inreely overcome.

Prot. E B Barnard recently obtained a photos of lialley's come; showing a tail our degree long comet is beginning to wake up Mr Ellerman witi sail for Honolulu on March 8th to observe the transit of for monounce of maint in the conserve file trainet or the little per council across the small disk. He his sent out by the comet complities of the Astronomical and Astrophysical Solety of America. He takes with him a good 4-inch portrait less by Brasherr and a 6 inch countries and monoting leat by the 1 its Observatory He is perhaps the best possible man for the work, and will be thoroughly equipped to obtain the lest results

During the night between October 7th and 8th, 1909 During the night between October 7th and 8th, 1909, a meteoric stoue fell to earth on the farm of Mr W P Nickerson, of Nurwood Mass. The meteorite is a handle mass of very hard gray stony material, much corrugated on the surface, about two and onehalf feet long in his greatest dimension one nearly one and one half feet broad and varying from one foot to one-half foot in the third dimension. Its volume was estimated as about 175 cubic feet lis weight as perhaps 275 pounds, and its density as not

Besides Halley's Contect two other comets may be expected in 1910 The first of these is Tempel's, discov ered July 4d, 1871, at Milan It has a period of 5.75 years It was observed in 1878 1894 1899 and 1994 It last passed perihelion in November It ought therefore, to be expected this spring

The second of the expected comets is that of Arrest discovered in 1851 and the return of which is expe in the summer of this year It was observed in 1857 1870, 1877 1890 and 1907 If was unfortunately piaced in 1903 and therefore could not be observed

The chiaf purpose of the sound proof room at the University of Upsala is the losuring of perfect freedom from sounds from outside By building it us platforms of thick lead and coment and by construct ing its walls of many thicknesses of felt, cork, ashes-tos, and other bad conductors of sound vibrations, the principal object was attained. The room is so quiet that the beating of ones heart or the creaking o one a muscles is at once heard on taking up a posi tion within its closed doors and windows and the only defect of it as a laboratory for acoustic experimenis is that vestilation is absent, and no or remain in it for more than an bour at a time

Prof Lipmana announced before the Academy of Sciences that Madame Curle has obtained a tenth of a gramme of polonium with which she has been ex a gramme of polontum with which she has been sey portnessing Polontum to a radio-active element discovered by Madame Curtle as early as 1888. Intuit of both and the state of foses its power very much more rapidly. It seems rea sonably certain that poloulum is identical with radium F, me of the series of inclais produced by the decom position of radium. The particle of polonium ob-tained by Madame Curle is not entirely isolated, but was combined with accord touths of a militeramus of another hody

A special investigation of the motion of the hridge of the violin has been made by J. W. Gillav and Prof. M. De Haas of Amsterdam. They conclude from their experiments that the bridge of a violin performs a parallel as well as a transverse motion, and that the timbre of the tone is modified greatly whea the in-tensity of one of the motions is altered and the other is left unchanged as nearly as possible have also explained the action of the muto, and the la have also explained the M flow of the mato, and the is a floser which the use of too likely or too thin a hridge has on the sound of a violin. The mute is composed to supposed to "dampent" or "dampent" or "dampent and the matter caused nothing but a general damping by reducing the hridge motion, the mute would only wakes the sound, and the same effect would be obtained by bowling softing an action, without a manuface, but here to trade of softly on a violin without a mute as by bowing hard or a violin with a mute. That, however is by no me

Scientific American

A NEW TYPE OF SELF-DISCHARGING COALING VESSEL

BY E. C. COLEMAN

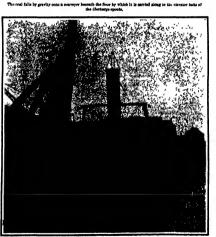
The new system of belt-conveyor discharge has been installed by William Doxford & Sons, Ltd., in a new vessel—the steamship "Paillon"—which they have recently built at the Pallion shippard, Sunderland, England, to the order of the Dunrobin Shipping Compnny, Ltd of Newcastle-on Tyne This vessel has a length between percendiculars of 270 feet, and a ingth between perpendiculars of 270 feet, and a carrying capacity of 3,100 tons on a 17 feet, in the draft. The machinery, comprising triple-expansion capine and multitubular bollers is placed aft. The cabin accommodation is fitted in the bridge and the crew squeece in the tore caste, while the mavigation

accommodation is about midships The inner bottom is raised and shoped upward in the wings and hullt into the sides of the vessel forming a sultable incline for gravitating the enrgo to the con veyers, and also giving the vessel veyers, and also giving the vessel the advantage of being about half loaded when in ballast and bunkers in the center line is constructed a sinps-top fore peak throughout the hold and between this tunni and the tunnel extend her from the entries market to the ing from the engine space to the raised portions of the double but loin are placed the conveyer belts of the Rohins pattern one on either side of the vessel. The eldes of the tunnel below the level of the hatchways over the belts are open for free access to the belts and tarriers at all times. Over these conveyor belts are placed strong iron guide plates extending the full length of the hold and par-tially covering the belts leaving a 24 inch hatch over a 36-inch belt This space is covered in the holds hy cross-laid hatch covers, 9 inches in length and 3 inches in thick ness, which support the cargo and leave the conveyors to work with out carrying the load At the after out carrying the load. At the atter end of the hold a portion of the hatch, over which the 9-inch hatch cover is omitted is covered by a horizontal iron side door operated by a ratchet in the tunnel. On the foreside of the hulkhead is constructed an access chamber in free communication with the tunnel which is of such a form as par-tially to protect the silds door from the cargo when loading, and in the floor of this projection of the chamber is fitted a flap hatch to give access to the hold from the tunnel At the after ond of the cargo space the conveyers rise from the horizontal and pass up ward in iron chambers through the machinery space, and thonce into the conveyer-driving angine room and discharge the load into guide shoots in the stern of the vessel These carry the load on to return belts, which are extended forward both sides on the deck. In a sim-ple form these conveyers would terminate at the fore end of the machinery space, or poop front and the load would be delivered into side shoots which telescope and are adjustable for loading barges on either side of the vessel, the shoots being suspended from derricks or other suitable means. in cases where the discharge is required at a higher level than is attained at the poop front and a large range of elevation is necessary, as for instance, for delivery

on high quays into trucks and into barges alongside, the conveyors are carried forward and hinged at the poop front, and the delivery end is sus-pended by sultable tackie from twin masts or framework, and is raised or lowered according to circum-stances, delivering the load into telescopic aboots sus-pended therefrom When the delivery is into tracks, the "offnide" beit delivers amidships into a cross or the "omittee over centurys aminantps into a cross-own-veyor ampended on the masts, which carries the load to the shore side and delivers by aboots into the tracks. A development of this principle has, however, been

applied to the steamship "Pallion," as, in order to ob-viata the use of delivery shoots, which results in con-siderable damage, the terminal conveyors are carried siderable damage, the terminal conveyors are carried in swirel booms, which are raised or lowwed and swung overboard to the points of delivery, thus per-nitting of the cargo being conveyed direct to the truck or barge without abouts. These booms may also be swung across to the reverse side of the vessel, so that both booms can deliver simultaneously into trucks or warehouse. Another important feature of this dis-

View of the hold



The coal is taken from the bottom of the bold and discharged at an elevation of 40 feet above the water by too and elevating belts operated on the ship. Rate of unloading 100 tone per hour, cost two cents a ton. A NEW TYPE OF SELF-DIRENTARDING COALING VESSEL.

ent lies in the method of delivering

coarging arrangement new in the memory or seavering the cargo onto the belts from the hold, and enabling the operator to have full control and free access at all times to the conveyers and to the fice of the cargo. He may thus superlatend and direct the continuous es at all He may taus supernread and arrest tas continuous flow, and be in a position promptly to correct any tack-ency of the cargo to bridge or to chelps the aperture leading to the belt, which, being the smallest space the load has to past through, insures a centifusous and un-interrupted delivery.

The unloading of a carge of coal is carried on as follows: Presumably the holds are full and the cargo lying solid, carey under the overhang of the chamber on the builthead over the side door, at which point the space is naturally only partially filled. The side door in the covers over the convayers and favors back by the operator in the tunnel, and the loose coal over if immediately travels on to the conveyer, which may or may not have been started. If running, then the flow continues; if standing, no difficulty are the channes the conveyer is culty arizes because the conveyer is

flow continues; if standing, no diffi-culty arises because the convayer is only filled at that point, and the aperture becomes blocked and only clears and flow when the belt is started. Then, if no "pridging" oc-curs, the after part of the beld is rapidly emptied on to the conveyor rapidly emptied on to the coaveyer which is carrying it on deck and into the receiving trucks or barges. If. however, any "hridging" is threatened, the operator in the tun-nel ascends to the chamber, and has free arcess over the aperture to correct any block. If "hridging" is occurs higher in the hold, then he hreaks it hy means of a pinch bar through perforations in the chamber through perforations in the chamber sides. When the after end of the sides. When the after end of the cargo has run to its natural angia of repose, the operator now in the hold merely removes the first cover and places it aft of the aperture and piaces it att of the aperture allowing another portion of cargo to run, he being in a free position to maintain the run and correct any tendency to bridging and to abnormal rushes. If such do occur and incline to block the aperture, he again corrects this and, having run so much more, he removes the next segment of cover, and so on, gradually transferring the aperture from the after end to the fore end of the hold The wing tanks and central tunnel being sieped, the cargo gravitates to the aperture, and the finals are manipulated by and the links are manipulated by the operator, one man being on each side of the hold. An important fea-ture is the inclined shoot, over which all the cargo passes on to the bell. This shoot is carried on travelers on the guide plate sid and is moved by the operator in the hold forward from stop to stop to correspond with the movement of the aperture thus allowing two men to manipulate a whole carge at the rate of 500 tons per honr It is estimated that in regular working the ateamship "Patition" will be un loaded in six hours, or allowing for stoppages in moving barges, etc., seven to sight hours, and this too with but one stoker, one engineer, two inhorers in the hold, and two adjusting the shoots or booms into adjusting the shoots or booms into the craft The total cost of dis-charging the cargo of the "Pallion" will not axceed \$60, incinding tha upkeep of the gear, and it is af-frened that the cost of discharging a similar cargo at, for instance, the port of Hamhurg, is about \$560, that in the work no fewer than 110 men are employed for about elevan hours under favorable condi-

tions.

A steamer such as the "Fallicot" is independent of shore ishor, and so may avoid the frequent delays arising from labor troubles. The humber of more required is see small, and the tion occupied so short, that it would be a single matter to agree the result of the vessel that they receive a fixed the crew of the vessel that they receive a fixed by the crew of the vessel that they receive a fixed by the crew of the vessel that they receive a fixed by the crew of the vessel that they receive a fixed by the crew of the vessel that they receive a fixed by the crew of the crew of the complex products of the crew of the c

Roof Paint.—Mir 35 parts of powdered chry sheks, 30 of powdered mice slate, 36 of powdered American reals, with half the quantity of pure cent far and bolt until an easily braichable masse is, 0005/800.

NOVEL ELECTRICAL APPLIANCES

BY PERCY COLLINS

The largely increased use of electricity for illuminating distilleries, wine-collars, etc., has rendered obsolete many appliances which were formerly in use-especially those which consume contagns when in opening the continuous contrages when in opening the contrage of especially those which consume coal-gas when in operation. Hence areas a demand for up-to-data inventions designed to meet the conditions imposed by progress. For recent patient illustrates more strikingly the manner in which the ingenuity of mankind beep pace with the exigencies of modern trade than those which are illustrated in the accompanying photographs. The patentoes and manufacture of these original electrical appliances is lir Frederic Bugbes, and of Lendon, Kanghad, and it is to this gestleman that of London, Engiand, and it is to this gentleman that the present writer is indebted for permission to de-sorthe and illustrate the apparatus in question. In the case of the electric search-light or cellar-torch, Mr Hughes claims that the appliance atanda sione, being the only perfect, clean, odorless and reliable invention for thoroughly examining brewers' casks.

vals, refrigerators, spirit or oil jars, etc.

The main details of the cellar-torch may be sp-The main details of the cellar-forch may be ap-preciated by reference to the accompanying photo-graphs. The reader will see that it consists essen-tially of a powerful electric glow lamp of peculiar de-sign, supported at the end of a suitably curved rod The circumference of this lamp is so small that the appliance can be used affectually through any orifice not less than half an inch in diameter

not less than helf an inch in diameter
The advantages of this new cellar-torch will be most.
readily perrelved if wo rompars it with the older
appliances which it has supersided The contact of
a gas jet, or a taper fanne, with a cold surface (such
a gas in the cold of a cast or jet jumedisticity produces a deposit of soot, which may be too slight to
attract the solice of the soarcher, his will never
attract the solice of the soarcher, his will never
the cold of the content, he will not be the cold of the content, his will never
the cold of the content, his will not be the cold of the content. attract the notice of the searcher, but will never-theless discolor and injure to a greater or less as-tent the fluid with which the vessel is utilizately illied Billinitry, when gas is used to "noon" casks, the products of combustion combined with the CO, already in the cask and the puspent door involved conocal the mustiness and thus deceive the sa-nainest, who accordingly verifice as clean a vessel which, as a fact, is far from being so With the partner searchight or cellar-borthe examination may be given as the control of the control of the colla-ter of the collation of the collation of the colla-tion of the collation of the collation of the colla-tion of the collation of the collation of the collation of the colla-

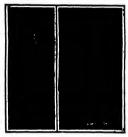
As the heat generated by the lamp of this cellar-torch is very slight, the appliance may be employed for the examination of vessels containing all kinds of inflammable fields or gases without the smallest risk of explosion. Each torch may be fitted at will with of explosion. Each torch may be fitted at will with an oblung or clreduar mirror, which is serwed to the extremity of the appliance beyond the lamp. Upon beliar passed into the jar or cask, a slight preserve against the side or bottom of the vessel causes the mirror to assume a horizontal position, and by this means a viow of the sacker surface of the vessel is readily obtained. The advantages of this device will readily obtained. readily obtained Tha advantages of this device will be at once appeared to the practical reader, who will readily perceive that by no other means can the whole interior wail of a closed resent be as otheroughly explored indeed, for the thorough examination of the interiors of long staves, bushes, bolier tubes, etc., there is no more perfect appliance obtainable than thighests calinatoris fittle will be reflector of suit-

In conjunction with his patent electric torch, Mr. In conjunction with his patent electric torch, Mr Hagbee has recently introduced another noveity in the thermo-cere or wax-melter. This is an ingenious appliance by means of which a perfectly continued supply of melted sealing- or bettiling-wax may be ob-tained. Like all the most important patents, the apparatus is simple in design and effective in use. When connected by means of the flexible

use. When connected by means of the bettins wire with the source of electrical current; it is held in the left hand—the right hand being porfectly free for use A glick of wax is fitted into the holder and held in place by means of a screw clip. The left thumh (overcoming a spring) presses the wax downward against spring) preses the wax downward against the beating receptace, and hy slightly inclining this the melted wax flows through a lip on to the letter, bothle, or other object which is to be essied Of cootres, as the wax maks, the stick shorters, and to complete the melting of the entire stick a slight movement of the hand downward on the handle oundless the thumb further to press the wax until the whole stick is consumed—the wax holder traveling in a list consumed—the wax holder traveling in a

grouped socket. Whenever it bosomes destrable to check the few of maltid wax, the pressure of the thumb is relaxed, when the apring easiest the wax to rise just sufficiently to free it from the heating life. A five of the advantages of the thermodiff unit be summersied, in the first piece, the wax to the contraction of the three piece, the wax to the contraction of the three piece, the wax to be a summersied. In the first piece, the

appliance may be used in the most confined space, and in any circumstances, with absolute safety from the fire risk which is so constant a danger wherever naked gas jets and feerible rubber tubes are employed. Again, the greatest possible economy in the use of wax is obtainable, there being no possithat melting is automatically storfeed the instant that



Wax melter in use, scaling bottle cerk.

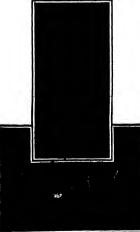
The electric wax

the applicace leaves the hand. No discoloration tha appliance haves the hand No discoloration or smoking of the wax is possible, and the most claim-inately littled sealing-wax will remain perfectly true to the original shade Flashly, the sealing can be receded to the continuously, and in any position, the appliance needing no perfuliancy properation, while all spin-ing or dropping of the wax is entirely avoided. The thermoever may therefore be used for sealing the term, possible particles of value may be to warde left in close proximitive without the activities of the water left in close proximitive without the activities of be safely left in close proximity without the slight-est risk of their catching fire

The New Agricultural Fortilisers The manufacture of fertilizers is one of the most

with the exploitation of the nitrate

The flevible electric celluntersh.



Colleg-torch heads, showing lump and mirror (detached). NOVEL RESOURCES APPLIANCES.

bein of Chile and the potash deposits of Stassfurt, is now in a critical stage of development, owing to the increasing production of nitrogenous fertilizers by the fixation of atmospheric nitrogen, and also to the resuits of recent experiments on the fartilizing effect of extremely minute quantities of totally new agents. The properties of both classes of these new fertilizers are briefly described by Rané Vallier in Revue de Chimia pure et appliques.

NITROGENOUS PERFELIERS OFFAINED FROM THE

ATMOSPHESE.

Nitrates Neutral nitrate of lime, containing 13 Mitrates Neutral nitrate or time, containing in per cent of nitrogen, has been manufactured at Notedden, Norway since 1905. It is an excellent fertiliser and equal in all respects to Chito nitrate it can be mised with superphesphate without causing apprecies of nitrogen or retrogradation of p acid its hygrometric character makes its applica-tion somewhat inconvonient, but it possesses, in con-trast with Chile nitrato, the advantage of adding to the soil lime, an indispensable plant food, instead of sods, the accumulation of which may be injurious to

It appe es probable that Chiis saitpeter for long, be suppliented by nitrates obtained from at-mospheric nitrogen. The Birkeland Eyde and other processes now in use are commercially practicable in their present form, only where water power is cheap, but these processes are susceptible of great improvenut these processes are susceptible or kreat improve-ment An efficiency equal to that of most other pro-cesses of industrial chemistry would make it com-marcially feasible to produce nitrates everywhere At present the nitric acid obtained from the air is nautrailsed with time, while most of the world's produc-tion of sniphuric acid is smployed in the manufacture of superphosphates. If this nitric acid could be used of superphosphates If this nitric acid could be used to convert the tribusic selectum phosphate into the superphosphate an enormous saving could be effected and a fertilizer produced which would contain both soluble phosphoric acid and nitrogen in a form sultable for assimilation, and would drive every of nitrogenous or phosphated fertilizer out of

The difficulty of applying the light cyanamide powder has been overcome by adding a sittio water, which combines with the quicklime of the crude cyanamide and forms a coarse powder called granulated cyanamide which is much m venient in use A still better form is oil cyanamide, venient in use A still better form is oil cyanamide, made by mixing the fina powder with 4 per cent of crude petroleum. The proportion of nitrogen in com-mercial cyanamide has been increased by improve-ments in manufacture from 15 per cent to about 20 per cent, that of pure calcium (yanamide being about 35 per cent Cyanamide has now fairly entered into agricultural practice. The trust which controls the sale of the product in Germany and Italy sold 3,000 tons of evanamide in the first half of last year

Calcium cyanamide (CN,Ca), Irested with water and carbon dioxide yields dicyanamide (CoN,H_s) in and carbon dioxide yields divanamide (CA,H,) in the form of nearly insoluble colorisas crystals, which contain 68 per cent of nitrogen and form the richest nitrogenous fertilizer ever produced in some cases the cost of production of divanamide may be combonbalanced by the economy in transportation Applied to wheat in the quantity of 30 or 40 pounds per scre, it has produced excellent results

Guillin has proved that more than one-fifth of the diffine has proved that they was not amount in the hitrogen of rynamide is converted into ammonis in one week and more than one-third in two weeks, by the action of soil moisture Musentz and Notite observed in two months a production of nitric acid corresponding to 11/12 of the nitrogen of the cyans-

responding to 11/12 of mide added to the soil

mide added to the soil
The poisonous action on plants which was at
first attributed to cyanamide fortilizers appears to
have no existence or to be due to impurities The
germinating power of wheat treated with pure Cynamide or dhynamide is not diminished but is sometimes increased Munit and Notth bowever, observed a tomporary arrest of growth after the application of cynamide in bot dry wonther, and therefore advise the selection of a wat period for its application.

11 PERTILIZERS CONTAINED MAYONTEES HERDINGS MAYONTEES WHITE ADDITIONS OF THE ADDITIONS OF evanamide or disvanamide is not diminished but

disatases which are the principal agents in vege-table aynthesis. Nagaoka, in Japan applied man-ganese sulphate to rice plantations in quantities equivalent to from 16 to 50 pounds of Mn, on several serva, and obtained increases of crop of from 25 to 25 per cent. The beneficial effect persisted as assallest extrest, through the following year Man-mans absorbed as most account of the obstacles.

in Europe, Vocicker and others have obtained in The Europe, vocation and others have obtained in-receases in the crop of wheat up to 20 per cent from the application of from 25 to 50 pounds of managaness sulphate per acre Excessive dosos (100 pounds) dim-luished the crop Similar results were obtained with

Grégorie, Hendrick and Corpiaux observed little benefit from the application of manganese to suga ots, but Gasola obtained facrements of 46 per cent in roots and 26 per cent in sugar from mangane chloride and of 24 per cent in roots and 65 per cent in sugar from manganese sulphate—the chloride dim-inishing and the sulphate increasing the richness of the fulce

With flow (lurate obtained the enguriator increase 54 per cent in totally dry weight from mangane bloride, and 31 per cent from manganese sulphate He concludes from his analyses that the mangane and continues from his nanyays that the manganess applied is assimblated by the plants and that the dif-ference in molecular weight of the chloride and sul-phate determines the degree of influence on the formation of dissiances

But the effect equact be wholly due to the man gameso which is assimilated, for Borirand found no had been increased by manganese, than in the trol plants to which no manganese had been applied traj plants to which no mangameso had been applied And recent American copyriments have proved that fertilizing agents act parity by destroying the toxins tell in the soil by the preceding crops. Unstable man-gamese sails might be expected to promote the oxida. tion of these toxins Manganese exide, traces of which occur in most soils, is entirely inert. The greatest proportion of successes has been obtained with man ganese sulphate.

III KTIMULANTA AND POISON

American cuprimus term have revived the old theory of De Candolis, and proved that intertilly may be despected that intertilly concerns that intertilly near be despected to the concerns that intentilly concerns that intentil of these executions or prevent there consider these executions or prevent there formation. Unpure Rails The salts of copper have long been employed for the improve of developer have long been employed for the improve of developer have long been alies of the trape, and fields of young grain can be offered of certain maxious weeks without highring the grain plants by surging with a 5 per cent solution for counter submission 2010 for centry Bridal have a controlled to the counter submission of counter submission 2010 for centry Bridal habits 2010 for centry Bridal habits 2010 for centry Bridal habits. of comer sulphate Quito recently Breal has in creased the yield of make by from 27 to 86 per cent by soaking the seed corn in a copper bath and then drying it before planting. The bath was composed of 3 parts by weight of copper sulphate, 30 parts of starch and 1,000 parts of water

Eisc Javiller, Inforring, from the presence of sine in many plants that this metal must perform some function in vegetable physiology made an extensive serios of experiments which proved that infinit quantities of zinc promote the growth and multiplication of mold and yeast fungi and some chlorophyl-bearing plants. For example the growth of a certain pearing plants, for example the growth of a certain moid was stimulated by cultivation in a medium con-laining I part of aine in 50,000 000, the maximum increase was produced by proportion between I in 10,000,000 and I in 25 000 and still stronger solutions exerted an unfavorable or toxic influence. Mk heels and De Heen find that sine saits promote the germina

Also The large proportion of alumina found in the ash of criain exotic plants (more than 50 per cent in the Australian Irve Orites exvelues) led Yamano to try the effect of niuminous fartilisers Common alum, added in the proportion of 1/5 per cent to the water in which young barley plants were growing quickly kitled the plants, but proved much less injurious to bariey growing in the ground A distinct fertilizing effect, manifested by increase of crop was observed to follow the application of 1/20 per cent and 1/500 per cent solutions of ammonia aium to barley and flax the effect of the ammonia having been carefully eliminated

Hagnesia. The presence of magnesia in all plants

and in all soils long ago suggested the employment of magnesia as a fertilizer Tribot's recent sludy of magnesia as a fertilizer Tribot's recent study of the influence of magnesia in the transformation of se proves that magnesis can act as a ferment. Magnesian fertilizers were formerly employed, to some extent and with good results in recent experiments magnesia has been found to increase the crop of grain pointoes and bosts chiefly by promoting the assimilation of nitrogen

Brownine Aso finds sodium bromide stimulating is

Brumine Aso finds sodium bromide atmulating to very annial doese and poisonous ta larger doses to beans growing in pois One part of bromide to 50 million 5 million and 1 million parts of earth pro-duced increases of crop of 53, 48 and 29 per cent, reapectively

lodine and Fluorine Potassium lodide, applied in dilute solution, appears also to act as a simulant or a poison according to the dose. Aso and Susuki obtained a large increase in crop of rice from about 140 pound of the sait per acre int very little increase from 14 pound white Holizung distinished the crop of augar beels by one-fourth by applying about 410 pound per sore. Analogous results were obtained by the same experimenters, with sodium fluoride, applied

the same experimental to the same erops.

Rere Riements Cerium, like manganese, appears act as a forment Aso finde thorium rather injurie than beneficial to vegetation Nakamura has increase to 70 per cent, than beneficial to vegetation Nazamura are autocar-tha yield of rice, growing in pots, by 70 per cent, by mixing with the soil 1 100 000 of its weight of lithium carbonate, but a dose 10 times greater produced a maller increase (65 per cent), cassium carbonate, in the same doses produced increases of 1914 and 9 per

TV PACTORIAL SEPTEMBER

The discovery of the mechanism of nitrification and the fixation of atmospheric nitrogen by the bacteria of root modules, soon led to attempts to aid the process the addition of nitrogon-fixing bacteria. Nobbé and Hiltner patented a process of inoculating Nobbé and Hiltner patented a process of inoculating peas and boans and the soil in which they grow by soaking the seed with an infusion of a galatin culture of the bacteria of the root nodules. Bayer offered pure culture of Ellenbach's bacillus, inixed with potato pure culture of Fillenbach's bacillus, mixed with poster mest, but Macrker soon concluded, from the contra dictory results obtained, that the preparation had failed to prove its value. In 1804 the United States Duran of Agriculture distributed 12,000 boxes of Durwal or Agriculture distributed 12,000 boxes or bacterial cultures, which appear to have produced good results. In the majority of cases But the effect of these preparations is uncertain, as the abrupt change of medium may awrit the develop-

ment of the bactoria. The soil naturally swarms with nitrifying bacteria, but their growth may be checked by various causes which will have the same effect on the few millions that are added Stocklass has endeavored to obtain hardier varieties

by cultivating the bacteria in a large mass of earth, and has obtained remarkable results, but in view of the uncertainty mentioned above, it is prudent to defer indepent until several more years of experi-

THE VALUE AND THE PUTURE OF THE NEW PERTILIPERS. The value of the nitrogenous fertilizers obtained by artificial methods has been abundantly and decisively d, but the same statement cannot be m regard to the other new ferlilizers wery one of which has given contradictory results in the hands of differ ent experimenters. Similar nucertainties, however, attended the earn experiments with other chemical attenties are early experiments with other themless fertilizers the value of which is now universally rategorized. We have learned how to use nutrient furtilizers and we shall learn how to use stimulants. And this knowledge will be productive of incalculable benefit to agriculture.

Charcot and the Anterette

Lest anyone should suppose that Dr Charcot went to the Antarctic lergely for the purpose of reaching the pole it may be said at the out the pole it may be said at the outset that his chief chief was one of signifite research only He only reached latitude 70 degrees, and therefore can hardy compare in netherament with his proferensary, and notably with Bhatkiefon and Srott. What he did was no explore a region of archipolages and waterways, of which very little is known, and to broaden our knowledge of an ice barrier which extends westward from the South Shettand Islands subroken Although Dr. Charcor roturns with nore of the laurels of Shackiefon and Scott, his explorations will be of much assistance to fature Antarctic explorers

be of much assistance to inture Antarctic explores From the mager account of his findings it won seem that any attempt to approach the pole by way of the straits of the South Shatland Islands is doomed of the stratis of the footh Shakhad Islands is doomed to failure, and that Cummander Fearry pike of a tacking the pole is a direction opposite to that pursued by Shackelon is hopeless. So far the only starting point that holds out any promise at all is the base of Roard is be barrier, where the volcanoes that the base of Roard is be barrier, where the volcanoes that of the factor are to be found. Here and here only one an expedition winter not mere than a few hundred miles from the pole

The Current Suppl

The current Supplement.

The current Supplement, No 1782, contains some very striking illustrations of the Paris flood, which show to what extent the current paris flood, which show to what extent the capital of France has suf-fered from the inundation. Mr H F Stimpson contributes an excellent article on efficiency in shop opera-tions, in which be shows how shop efficiency can be creased, as well as some results secured by the cibeds which he advocates. Mr Claude Grahamemethods which he advecates. Mr. Claude Grahams-while, in an article "Some Experience of an Ari-ator," hotebes his own experience, and thus shows many an anging artister what he has to avoid. An-other paper on explosives for use in cost mines by Manroc and Itall is presented. The second and cos-cieding insistiment of the article on the Wright in-pared on the second of the article on the Wright in-pared on the second of the second of the second and he specially contained to the second of the secon he pays a Iribute to that great man's engineering abil-ity. When the Nobel Prize was awarded to Mr. Marconi, he read a paper at Stockholm, in which he sum-marked the recent development of wireless talegraphy. That paper is published in the current Suppumment.

An Injunction Agein

An Esquession Agelmot Fundham,
Indeg Hand, In an opinion find in the United States
(Frout) Court, granted the injunction predests title
stated for by the Wright Company against Louis Paulhan, the French aviator, alleged to be using in his exhibition fights bere a machine which is an infringament of the patents granted to Orville and Wilbur
Wright. This decision prohibits ar Fundhan from
using his machine in this constrip-pending the trial of the Wrights' suit against him.

the Wrights' suit against him.

After discussing the prior discoveries cited by the
defense, Judge Hand in conclusion says

"It is, of course, unusual to grant a preliminary injunction before any adjudication and without any
sequisecence However, when the right is not seriously attacked, and when the infringement is clear,

the court should not hesitate to interfere
"From the showing made I cannot doubt that the
complainants first put into any practical form the system of three-rudder control. That there may be othe systems is not the point, let the defendant use those if he will Nor is it necessary to conclude that the complainants were the first to fly Upon that I decide nothing whatever, for it is not an issue in the case. "All I do say is that I cannot find that anyone prior

and that the changes from the specifications which the defendant had made are no more than equivalents which do not relieve from infringement.

which do not relieve from intringement.
"It is quite clear that for the complainants' protection a writ must go pendonto Hic, because the defend ant, being a non-resident, who is here transiently, there is no way in which they may insure themselve. of the monopoly they have acquired except by p ing his use of it at once

A Library in the Sahara.

The French Colonel Gaden, who recently led an expedition into the southwestern region of the Sabara, found in the course of his investigation that one of the most powerful princes there, the Shelk Sidia, was the next powerful princes (nert, its Sans; Salas, was the founder and possessor of a rather large illerary, a report of which is published in the latest number of the Revue du Monde Musulman Tiple library is small, indeed, when measured by our ideas of such a founda-tion, for it contains only 683 books and 612 manuipts Still it not only preves that a most urgent ed of books has selzed the most distant outpost of

scripts and the most distant outpost of most of both has selesd the most distant outpost of most of both has selesd the perceived lively laterest in consequence of its composition. Approximately the books composite thirty groups relating sepacially to koranic crudition the decrine of latth, history, jurisprudence philotopy, travel and discovery, poetry and fettion, married life, magio recipes, wherevertaint on dreams and sarriedny. The limits of the married life, may be composed to the contract of the married life, may be composed to the contract of the married life, may be considered to the contract of the contrac interpretation of dreams and astrology. The libratherefore, bears the impress of sheer orthodoxy, wh is further manifested by its lack of books from for-bidden provinces, such as philosophy and the natural sciences, but airrady the existence of printed books, scilon of which is deemed a rigorous contra diction of the strict tenor of the Koran, proves that the revolution in the production of books, which began in Stamboni toward the end of the eighteenth century, in Stamboni toward the end of the eighteenth century, has to-day acquired citizenship in the whole islamitic world, and that at no remots day also in this circle of culture and of passionate political aspiration and arbitrement the printed book will force the written arbierement the printed book will force the written book into a very dim background Islam, long ob-structed by orase ignorance of many foreign things cleed a most beneficial force of the province of the cleed a most beneficial flower on the daily life, is now quickneed by the frequent book in its own tongues, which comes galloping from European publishers even into the precincts of its haughtiest orthodoxy. The printed book is already an irrestitible leaven in Islam,

Booth of Altred B

Altred Spear of Passalo, N J., died at his home in his 87th year He was one of the first who ever con-ceived the idea of a moving sidewalk. His model in-terested such men as Peter Cooper, Horace Greeley, and several other prominent men. The scheme has so much to commend it that two Legislatures, those of 1873 and 1874, authorised the use of his sidewall but the Governor of the State veloed the bills.

liveness of the Telephone

Proces has calculated that an audible sound is pro duced in a telephone by a current of 6 by 10-2 am peres, and Pelist has calculated that a sound is produced by a difference of potential between the two sta-tions, amounting to only 1-2000 volt. These statements tions, amounting to only 1-2000 work. These statements give some idea of the great sensitiveness of the most are telephone, but the sensitiveness of the imman our, which perceives the invasible vibration of the telephone displacement, is no loss requiripable.

Correspondence.

WORD A TRACLING GAR REVERSED ITS POSITION.

To the Editor of the Scherttin America.

To Ismany 50th, 1916, about 13.40 P M, a curious and unique socident happened in repart to limited car No 130, D. and F, at the crossing of Main and ash Streets, Piqua, Ohio. The phenomenon was so remarkable that I have concluded to make this report of it, and if you see fit you may lay it before you

readers.
The car was headed south on Main Street, running perhaps ten or twelve miles per hour. At the switch in Ash Street, where consection is made with the city line, the rear truck left the main line and followed the Ash Street line, and the car body turned completely end for end, returning almost completely to the main line. Nother truck was at any time off the ratia and erest the truthey wheel was still in work ing contact with the over-head wire when the car ing contact with the over-boad wire when the car stopped The brake rod connections were all stripped and torn loose, also the wire connections from con trollers to motors were severed. No one was sariously injured, and a casual observer coming on the seeno, as the writer did, a few minutes after the occurrence ould not notice that anything out of the ordinary

had transpired

The attached diagram shows five positions assu-The attached diagram shows five positions assumed by the car in its wonderful evolution. The relative position of the truck with reference to the body and also to the tracks is shown, the end of the truck normally positioned toward the center of the car body being indicated by o and b The end of the car headed south before the accident is indicated in each figure

Fig. 1 indicates the status of things when the truck

ee in the Himalayas and who stated much experience in the Himalayas and who stated to Prof H. O. Parker that the amount to be allowed for retraction on high snow mountains was most un-certain, that therefore the altitude of the great Himalayan peaks, though given in precise figures, was still in donbt

still in donot Furthermore, I once met a former member of the British Royal Engineers who told me that the triangu fallon of the well-known mountain K' recently at tempted by the Duke of the Abruxi, was made by a

tempted by the Dike of the Abrusti, was made by a friend of his, whose allowance for refraction was deuble what he thought should have been made. With the smaller allowance IX would be about 4000 feet higher than it is now regarded. It similar allowance for refraction is most on Husseatia, it may easily hap-pen, especially in a country with a much drifer atmo-phere than facing that the thought of the pro-pered that the three three three three three three pulses than facing that the three three three Accordingly while it is perfectly proper for all who desire to do so to accept the figures of the trinapula time, regardless of the careful cultural of mayelf and

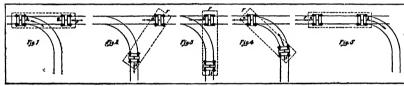
of the Swiss guides and of the evidence of the photo-graphs, no one need feel obliged to accept those figures es Anal

As to Aconcagua being the highest of the Andes. I may say that aside from Hunsearan there are several mountains which may prove when carefully measured to be of greater altitude than Aconcagua

in this connection it may not be wholly out of place to say that white Mrs. Fanny Bullock Workman has. according to the newspapers frequently announced her readiness to furnish evidence of the attitudes claimed hy herself, whon I wrote to hor stating that I should be glad to see the figures of her observations, an in terest shared by some other Alpinists she informed me that they had not been published in any of her The Harriman is a special 4-cylinder motor of 50 horse-power and weighs 200 pounds 1t bas copper water jackets and aluminium crank-case The bore and stroke are 5 inches. The 5-cylinder V type motor hes se and cylinders cast of macadamite erank-case and cylinders cast of mecadamits. The cylinders are lined with cast iron and the plutons also are of a special grade of this metal. The bore and stroke are each 4 inches. The output is 50 horse power at 1,300 revolutions per minute. The 12-cylinder Vtype Buffum motor is constructed similarly to the Easton each row of cylinders being cast in one piece with the upper part of the crank-case and afterward being bored and lined with east iron. This motor is beautifully finished Its weight complete is hut 415 pounds, and an output of 100 horse power is claimed for it at

and an output of 100 horse power is claimed for it at 1 800 revolutione per minute Upon entering the large main hall of Mechanics Building the visitor saw upon his right the Bierlot and Antoluetto type monoplanes of the Scientific Aero plane and Aliship Company of New York The former of these machines which is fitted with a 4-cylinder air cooled 2 cycle motor has lately been experimented with open he by Mr Stanley Y Beach and he in a fair way of making a flight in the near future. The Antoinette type monoplane was shown with a huge red 9-foot pro-peller of special design, which has been found to be peter of special orsign, which has been found to be very efficient A novel type of stevering goar having two superimposed wheels was also fitted. Opposite these two machines were two Wright type hiplanes of Frederick P Schneider. The finished one of these two machines had movable daps upon the rear edges of the wings instead of the warping arrangement use Wrights.

reeding onward around the hall, the visitor next saw two new monoplanes—one (the Morock) a small demountable Bleriot type machine having wings laced upon steel tubing and the other (the Burlingame) a



b is about to turn from the main line. Figs. 2, 3, and 4 ow intermediate positions, and Fig 5 the car when it came to rest Pique, Ohio. E B RAVER

(The mere momentum of the car would not account The mere momentum of the car would not account for the return of the car to the main line. The fact that the trolley wheel remained on the line suggests that the motorman must have reversed the rear motor, which acted to push the car back in the reversed post tion to the main line.—En.]

MISS PROK REPLIES TO MES. WORKMAN. To the Editor of the Scientiffic American

Having observed in your laste of February 12th a letter in reference to the sittitude of Mount Husscaran and my record from Mrs. Workman, may 1 state my own position a little more definitely?

After making the ascent of Mount Husscaran, north peak, September 2nd, 1908, of which I brought back absolute proof in the shape of photographs, I gave my reasons for believing the mountain to have an altitude of 24,000 feet, although on account of the bigh wind had been nuable to take hypeometric observation

on the summit. ally, I did not expect the scientific world o

ASSUMANCE, I did not expect the scientific world or suryone else to regard my estimate as an exact measurement. If anyone did so, I cannot be responsible it was, of course, quite within the province of any one to take so great an interest in the matter as to spend some thousands of dollars in sending engineers to Peru to make a triangulation of the mountain and

publish this as the absolute height of Husscaran There is, however, something to be said in regard to the accuracy of such triangulations. Permit me to quote from the recent work of Mr A. L. Mumm (of the English Alpine Club), "Five Months in the

Himstayawa"
"The results of triangulations do not always agree and even when they peculically onlinds, they cannot be accepted an absolutely insupervalsable. There is used researc to suppose the property of the property of the property accurate and feet be allowances useds fore it to be perfectly accurate and the higher and more research the summit, the larger is the possibility of everor. Barriag these facts in saids, it will be possible to be a supervise that the saids of the possibility of everor. The property is the possibility of everor has a summer of the property in the possibility of the and will have a still the loss the same to what premare as that its Longitud (who made has according and will have at at that Longitud (who made has according and will have at at that Longitud (who made has according to the very line a good apportment to establish the recent of a problemour.)

disinterested authority is Dr. Norman J. to of the English Alpine (Rub), who has had

writings, nor did she offer to give them to me per-sonally Anny 8 Pack

New York, N Y

The Acronautic show at Boaton.

The first exhibition of aeropianes, balloons, and sero nautic apparatus exclusively to be held in the United States was held in Mechanics Hall Boston, Mass, from the 16th to the 23rd Instant This first Act Show, although fairly representative of the different experimenters, was somewhat of a disappointment in that there were no motor-driven heavier than air ma that there were no motor-driven heavier than-air ma-chines exhibited that have artually flown, while 60 per cent of the power machines were shown without mo-ters. This fact however, did not deter one from get-ting a good idea of the design and construction of the

proplanes proper
The question of reliable light weight met sonable price is still a hurning one, and a fortune awaits the man who will produce such motors—of 25 and 50 horse-power respectively—to supply them to aviators upon easy terms. Eight different makes of motors were on exhibition, three of these (Curtiss, Cameron, and Harriman) being of the 4-cylinder cycle type, two (Waterman and Duryea) of the 4-cylin der, 2-cycle type, and two (Easton Cordage t'ompany and Buffum) of the 4-cycle, 8-cylinder and 12-cylinder V (type respectively An Elbridge 3-cylinder water-cooled type respectively An Elbridge 3-yillader water-cooled 2-yile motor was also shown on the Wright type hi plane of F P Schneider The £5-borse-power 4-cylin der Duryes motor which was shown npon the Bleriot type monoplane of Stanley Y Beach, is alrecoled by type monoplane of Stanky Y Beach, is alrecoled by means of this copper strips where to the cylindors. The Cameron motors—a 4 and a 6-ylindor of 30 and 45 horse-power respectively—are also alrecoled with the usual cast Sanges. The smaller of these two motors and the Duryak motor both weight about 300 pounds, or approximately 50 pounds more than the Curtiss 32 of water-coloid motor with reduktor and water. The reason for this apparent enperiority of the water-cooled motor as regards weight is found in the fart that the motor as regards weight we found in the fart can the Curties is a specially constructed acronautic motor, whereas the air-cooled motors mentioned are simply antomobile motors adapted to aeronautic use and not injetteed nearly as much as it is possible to lighteen them. The same may be said of the Elbridge, which is a marine motor The Waterman, another lig rise motor built for canons and dories, weighs just under 100 pounds complete with flywheel, which can be dispensed with, and develops about 15 horse-power

large monoplane with trussed inclined struts running from the bottom of the wide central frame to the er of the wings A 56-horse-power Harriman motor, di-rect-connected to a large and thick propeller, was placed at the front of this monoplane

placed at the front of this monoplaw. A hijianc hat attracted considerable attention was that of Victor Pape. This had a rectangular central today and extremely thick wings with a deep currature. A novel revolving cylinder Acycle motor the L. A. W.) was prived in front, so the propelier monoided upon it could be directed upward or downward. The laxyward and Kritkens bilbanes were construct.

ed entirely of bamboo In general outline they re-sembled the Curtiss, as did also the Bisner & Downey sembled the Curles, as did also the Elsaner & Downey and the Read machines "The Erickson biplane had a tulick automobile motor weighing 240 pounds fitted, the weight of the biplane alone being but 220 pounds. This finest piece of construction on exhibition was the Herring machine, both by the Starting Burgess (Conserve as well known by a thuilding concern of Mark.)

Company, a woil known but building concern of Marbishend, Mass This machine, in general appearance resembling the Curtiss biplane was mounted upon three round skids no wheels being used. The horizonial rudder was worked by the aviators feel and the zonial rugger was worked by the aviators need and vertical rudder by hand. A long inclined not was placed on each side of the seat, to while the aviator can cling. Springs were introduced in the guy wires, no turnbuckles being used. The poles that earry the front and resr rudders were all hollow A Curtiss motor with a 4 binded propeller of Mr Herring's design motor with a 4 binors proposer of Mr Herrings design was fitted. The machine complete weighted less than 400 pounds. The propeller is said to give 260 pounds thrust, which, it is claimed, is ample to start the ma-chine on any ground on its skids. The stability device

thrust, which, it is claimed, is ample to start the ma-chine on any ground on its skids. The stability device for lateral squilibrium was not; shiblind. There were also several glidter on view, and a large number of models of all kinds, most of which were hullt by boys. The schibilion as a whole was a venter creditable on The cathilion as a whole was a venter. will soon catch up to Europe in the aeronautic industry as it did with the autom

Balloons were also in evidence Among them was the New England Aero Cluh's balloon in the very mid too new magaing Acre Cura a contoon in the very mid die of the hall, inflated almost to its full capacity This balloon has made 45 ascensions and has traveled 1,251 miles Leo Stevens axialited the banket of his 10-passenger 160 000 embie foot balloon A huge hotair balloon from which a trapeze performer made five ute drops at Coney Island last summer is also

THE COCHIN FOREST RAILWAY

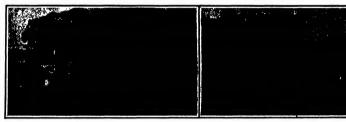
BY EDWARD HARRAN

The Cochin Forest Tramway is an interesting little line of tramway on the meter gage in the semi-inde-pendent State of Cochin in South india it runs alightly to the north of the 10th parallel of latitude and to the east of the 75th parallel of longitude, and owes its origin to the fact that the forests of Cochin owes its origin to the fact that the forests or Occurs form one of the most valuable sasses of the State, their approximate area being 505 square miles, or nearly one half of its entire extent. Their commercial importance it is steled, was vaguely realised as far-back as the beginning of last century, but the earlier back as the beginning of tast century, and the earner attempts to work them were of the usual spasmodic and unsystematic nature which characterized original efforts in forestry throughout the Indian peninsula. In the year 1835, however, a regular forest depart-ment, under the control of a European officer, was d and worked for some sixty years on old fash-lines Though the department throughout this period brought in a certain amount of revenue to the

fact that a land route, provided means of transporta-tion over it were available, would tap a far richer forest area than a proposed river route alone, while, of course, it would be open all the year round. So it of course, it would be open all the year round. So it came about that the ides of a transway in three sections arose, was recommended to and sanctioned by the Durbar The first section was to cover a distance of 8 miles in the valley, to be followed by a self-acting inclined transway 5,000 feet long. The second section, 4½ miles long, was to be followed by a self-acting inclined produced to the Karumani River, from which point timer could be founded to the railway station at Trichar during the monascent period and According to the first processing the second section. The second section is the second section of the sect According to this first propounded scheme, timber from the hitherto unworked Parambikolam Forest was to have been foated by the Parambikolam River to the tramway terminus in the valley A visit paid by his

logs both at the head and floor of the slide proved ex-pensive. To remedy this latter, the conversion of the slide into another self-acting incline was decided upon. side into another self-acting incline was decided upon. To remedy the first, Mr. Alvar Chesty recommended, and the Durbar anactioned, another extension of the transway, one of 15 miles to Chalakudi, to meet the Shoranut-Gochin Reliway at that station, a connec-tion, with the acquisement of the Madras Railway authorities, being made between the railway and tramway there.

transary there. To day the total length of the line as it stands computed at the time of writing is 4½ miles divided hise three sections. The first section extends from the 10 to 21, the second from mile 31½ to 37, and the third from mile 310 to 1½. The first and second second are connected by a self-secting wire rope manipolated double way of 1½ miles, while the second and third sections are similarly connected by another incline a



The logging lucometive, truck, and cabenee

Stene-and-timber bridge on the line of the Cochin Ferest Railway.



Riephants moving logs for shipment.

A train of timber cars. Note the density of the ferent growth. THE COCKIN POREST RAILWAY

State, there was little or no pretense made of admin-istrating the forests on aclentific principles, with the more or less natural result that while the interior of the forest area (from which there were no facilities for transporting the cut timber) remained practically untouched, work being confined to the more accessible portions and those from which transport was easy it was not until the year 1895 that a more for the better was made when suggestions were made by the Resident, Sir James Thomson, which culminated, early in 1897, in the Medras government placing at the dismi of the Cochin State a British forest officer, Mr possition of the co-can cause a prignal forces outcome, and Foulkes, for the purpose of inspecting the forcets and formulating proposals for their better and more profit-able administration. This gentlemen's report in-cluded the recommendation that the services of a trained and experienced forcet officer be obtained, and, acting in accordance with this suggestion, the Cochin Durbar obtained from the Madras government the loan of Mr V Alwar Chetty TFS for a period of seven years. His first care was to inaugurate a period of rest for the overworked area of timber and to set about securing a suitable outlet for the prospective out-put of the then virgin forests. Surveys disclosed the

Highness the Maharaja of Cochin to the Parambikolam and Nelliampatty forests in October, 1903, suggested a revision of this scheme which provided for the extension of the proposed tramway to Paramhikolam, an additional 12½ mites, the experience gained during the preceding year or two having shown conclusively that the Parambikolam River could not be relied upon

that the Parambikolan Rivar could not be relied upon to carry every year anything like a year's full yield of timber A survey of this extension was made by Mr Haldwell, a specially engaged engineer, in 1964 According to the original soluens, the traction of the timber trucks was to have been by manual labora-but when the length of the proposed line amounted to the timber trucks was to have been by manual labor, but when the length of the proposed line amounted to 31 miles, it was recognized that manual labor would prove both too expensiva and too laborious, and in Suptember, 1904, indemotive engines traction was fassily decided upon. The modifications of the original scheme siready almodd to accessitated a full reconsideration of other portions of it, chiefly the pre-consideration of other portions of it, chiefly the preposed combined river and read transport which it was anticipated would not clear the accumulations of timber Also in practical working it was found that a timber alide, especially in the case of lengthy, and heavy logs, was unsatisfactory, and the handling of Throughout its whole length the Cochin Forcet State Railway is excellently constructed. The gage is 1 meter; the average gradient of the line 1 in 80 and the maximum gradient 1 in 2.5 which gradient occurs on tha third of the five inclines which have been embodied in the construction

embodied in the construction
The inclined ways are so constructed as to be selfacting, and three of them are situated in series between 31 and 33 miles and the other two between 38½
and 33% miles. They are worked by means of wire
cables controlled from brake houses by gear brakes independent of each other, and consisting of horizon vibecia round which the cables pass two or three tim The inclines are double railed with suitable ero The inclines are double valled with seitable crowner points at the up-full side of each brain house. The points are so arranged that a descending lead, which turved solve by force of gravity, requires practically no up-full significant the locomotive planes the truck, which no being moroupled is then ready for the descent. In some cases, however, empty trucks going to the plane to be hand-chusted after being placed, in order to place them: on the side of the upper distillation within the rection rept being. The regard first being placed in the which the rection rept being. The regard first being placed in the side of the upper distillation within the rection rept being. The regard first being the side of the upper distillation of of the upper distil

Scientific American

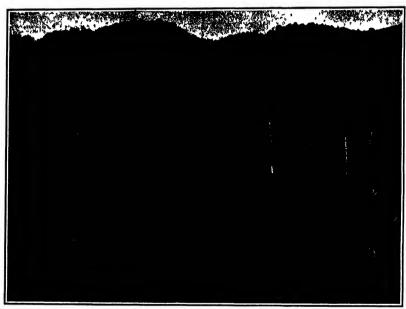
passes over a grooved pulley 6 fast diameter, after which it forms a figure 8 over a loom pulley back again over another 6 foot pulley mounted on the same shaft as the first and thence to the other line On the vertices shaft on which these two pulleys are, and on which the rope binds are mounted two hard stends drum pulleys each 6 cert diameter 2½ inches bread with ½ inch finnges Steel hand brakes 3/16 become vital plainty seem two consecut 7-9; Hotoles brook with 5 inch finance fixed band brakes 17-6 inch thick and 8 inches how a studied with hard wood brake blocks 6 inches iong on he applied to these drame by powerful inland levers controlled by the state of th

sistent examination Frod Moser has yet made. In this cave were found four such layers of clay separ-ated by layers of sales. While relics of the new d in the first at ashes in the third and fourth layers were discovered remains of the painters mussel land enails the bony scales of the swamp-turtle and a mammal fauna such as the otter beaver goat stag and wild bear which manifestly point to the fact that the first cave-dwell manifestly point to the fact that the first cave-design are recorded to the rests varie clienties for their sustance while the later cave-dwelfers found a much more generous sources of nourishment slong the coast An important fact is the presence in those oldest itsy rest of frequent tools and to the same layers belong the especially interesting art objects engravings on asimal home described pictorially many of them in the Professor's report. On a polithed pike of stage shows the control of the professor in the stage of the rest of the rest ing of a human figure that stands by twas two tree-large of the control of the stage of

Moser cave and very recently the Professor found a well preserved human lower javebone in the so-called Cave of the Beart Sandstone marked with gracere made by whetling the hose tools on them prove that the cares were also the workshop of the cave during a high digree of development is shown by the pottery the vessels formed by a free hand are manifold not only in their form and material but also in their de cration one piece being marked with a broad spiral band immediately on either side of which depressions of the vessels are filled with white olor in which are the earn of corn and leaves of pain which ormanent the hand. This piece almost reminds one of the description of Myennaan pottery

Have Fishes Memory !

Studies as to the mental powers of animals have aiready been made on several occasions but only reairrady been made on several octasions hut only re-cently have inquiries been made as to whether fishes have a memory or not Results have shown traces of a m mory both in coral southy a and other d threas of the d et Experiments have been made with sev



Part of the main line with empty train on a guar o THE COURSE PORRET BAILWAY

these inclines are here reproduced. The rolling stoo of the Cochin Forset Railway consists solely of ope trucks specially designed for carrying timber wit swiveled boistors and chilied cast-tron wheels

The Art of the CoverBweller.

A very noteworthy discovery of cares which has brought for the discovery of cares which has brought for the discovery of the discovery discov

On a second engraved piece of bone a jawbone that was found in the third layer of sabes is pictured with a contour of almost straight lines a wiid boar of which the head is almost triangular the tunks of which the head is almost triangular the tunk-being riestly drawn the eyes and ears being finitly indicated the bristles on its back appearing with per fact distinctions and the cut in its cut being rither indistinct. That the artist of the cave sought to re-produce the supect of nature in which he had often seen and siain the wild bear is shown by the high gream in which the animal stated and which is repre-sented by strong incisions. On a thinthoon is easily recognized the head of a sea turned with any and desp-y elast mouth the scales and folds of the sain re-indented here or a twintering dynam for and not far indicates of years, whereas and above the nead is a sufficient hint of a fluttering dragon fly and not far from it are tufts of reed. The two last engraved places of bone the Professor attributes to an early settlement in the new stone-age while the awkward portrayal of the man may be considered as derive! from the old stone-age

While the layers of ashes contained a generous num ber of finely worked tools of bone and pieces of orna-ment, the occurrence of relics of man himself is re-stricted to two sketetons with additions from the

eral fishes but the most striking results have been cheral dakes but the most striking results have been to intoned with the gray preb which lives hid yo on a maint situry; but deardine. Some of the a set taken and colored for and were live is that to it make when the pretty was with asserted oils; after-colored sar-ticles and the set of the set of the set of the isr'd and sation but it was not till hongry that the isr'd made a fentiative meal of one of the r d oil of victims on recogniting the sar lite flave; however hap recognity demolsh; it is r mainter 9 stacquently the specimens in the tank decour it the sardines irre-spective of color thus showing not only true so for accounting satisface to consider the satisface of the satisface accounting satisface to consider the satisface of the satisface. sequently sardines colored red and blue were pia ed in the tank together with the silver on s the came in the tank together with the silver on a th came, seen was represented the blue ones not hing size and till the others were sealen and hunger compelled in vestigation of the new content. After this introduction the perch ate the sardines of all the ryps with out any difficulty. Some spines of the sea nit! (as tinia) were then fastened to the blue sardines these were at once avoided by the perch who ry multiple out of the way of the peer country. This showed traces of memory as the results of content with the sea nettle were clearly shows and recognised.

THE NEWLY DISCOVERED GOBLIN SHARK OF JAPAN

BY DR. L. HUSSAKOF

Every now and then the zoological world is startled by the annuancement of the discovery in Japanese saters of some very rare or very ancient type of animal. So often is this the case that coolegists have come to look upon the deep waters of lapan as a sort of naturalists wonder restme a preserve in which five all manner of interesting animals some of them of an archab type long extinct in other parts of the The expectation of remarkable discoveries in these waters is so strong that I have heard a distinguished Annual was continued who is himself well sequelated

Inputese waters say that he would not be greatly surprised to hear some day that a real Mossesaur or ichthyosaur had been hooked in the depths of Auro Sharo or warm Illack Current of Japan

It is in these waters that Japanes ishermen occusionally take on their lines a shark whose grotesqueness has won him among natives the name of Tragagase or gobila shark One of these "gobilas" came into the hands of President

David Starr Jordan of Leland Stanford University a cozen years ago and was at once recognized as an Interesting at hak typs whose close relatives had long since become extinct. President Jorden described it under the name of Mitsukuring osostoni—the name being given to honor at the same time the late Prof kakichi Mitsukuri who for a quarter of a century was the leading light of Japanese zoology and Mr Alan Owston, a majural history desier of Yokohans, who was instrumental in securing the specimen name, by the way, does not stand at the present day but must be replaced by **Repenorhynchus—a name which had previously been applied to the leeth of the which ind previously been applied to the leath of the extinct speeds of this type of shark found in the rocks of the Chalk period, in different parts of the world in accordance with a lentific usage therefore, tha Japanese shark described by President Jordan st now be known as Scapanorhynchus occatoni

must now be known as geography has occated it is now to be recorded that a second species of gobiln shark has turned by in a most unexpected way II happened thus All of the sharks (aught in Japan in the past years and

sent to the various museums - shout muaeums — soott twenty in all—were A looked upon as be-longing to the same species, if overloss No one had ever thought of comparing several specimens, in so rare in numeums that comparison is generally quite out of the question 1t was therefore a pleasure for the writer to have had the opportunity of comparing several cimens in the coi lections at Columbia University and the American Museum of American Museum or Natural History and to find among thom a new apecles of the goblin shark. This has recently been de scribed in the Bulletin of the American Museum of Natural History as Scupanorhynchus jordani name being

given in honor of President Jordan, our greatest su

given in namer of revenuest jordan, our greatest au thorily on the fish of Japan Now to come to the fish himself As seen in the flustration (Pig 1) the new shark is certainly grotesque, well deserving his sobriquet 'gobijn' The largest specimen in this country is one in the National Museum at Washington measuring over cleven fo Fortunately it is not given to frequenting the bathing-beach, but keeps to deeper waters—usually about fifty fathous As is generally the case with fish from dep-ar water, this shark is soft and pilable. Even after bardesing in a preservative for several months, it can be rolled into a ball. The most remarkable feat ure is the curiously elongaled "nose" jahown in Fig. 2) It is this together with its protruding jaw and amail bendy even that gives the shark that usiv

appearance. The teeth (Fig 3) are sharp and sleuder, each like the pointed and of an awi. They constitute a most effective weapon, which must be fingered. with discretion even on the laboratory table the neculiar anatomical characters, suffice it to say the permiss anatomics in Caraviers, source it only that in the total make-up it is so different from all other sharks that President Jordan was at first in-clined to classify the genus to which it belongs in a special family by itself

As to the differences between the new species and the one already known, we need say only a few words



Fig 1.—The newly discovered gobila shark (Scapanorhynchus jordani).

The pictures show the differences at a glance even to the layman in matters ichthyological the layman in matters febbyological. The new form (thour pitture) is distinguished by a much less pro-truding Jaw, by a very much assuler spirsts (the uninet accessory still prior seen at some distance back of the eye), and by the fact that the eye is situated opposite the middle of the jaw instead of back of it. These features are quite sufficient, in the opinion of repreta, for separating our goodin as a distinct 'kind To the general reader they may perhaps be of interests as examples of the degrees of difference which are used by specialists to distinguish species of fish.

Pipe, Cigarette, and Cigar.
The question as to which of the three form smoking, the pipe the digarette, or the cigar, intro-duces the greatest proportion of nicotine into the umober's existen has never obtained a combistely deisive answer, allhough it has received consider discussion from time to time At one time it was freely asserted that the tobacca which contained the

ter of fact, carbon monoxide is invariably found in all tobacco smoke, and that direumstance should be sufficient to war nall smokers against inhaling it persistently. Theories as to what happens in the combation of tobacco in the various ways it is smoked next took into account the extent to which condenses then predicts were formed and retained in the time products were formed and retained in the properties of the proper length of the stem a comparatively small proportion of these condensation products reaches the mouth In the cigar, on the contrary, the densing process has a te to travel throughout the clear, at all events, as the cigar gets shorter the condensed product area graduthe condensed product area gradually reaches the mouth and eventually the products are conveyed there by the heat of the burning end it has been said by con-

noisseurs that no cigar is worth smoking after one-half of it has been consumed which seems to be cal considerations very suitable for application by millionaires. Again, a cigar that has been partially cal considerations very smitable for application by millionaires Aguin, a cigar that has been partially smoked and then allowed to go out is decidedly un-pleasant when re-lit, owing doubtless to the spread of condensation products to the mouth end. In tha case of the pipe, the burning area is always in the case of the pipe, the burning was is always in the same place, it never comes near the mouth, and therefore the probability is that the condensation products do not reach the mouth in, at any rate, ap-preciable quantities in the cigaretta the condensa-tion products eventually reach the mouth, but there is in this case less chance of condensation products forming since the combustion is unhampered, the tobacco being freely in contact with the air The quee tion of moisture, however, must not be loft out in these considerations, for it is obvious that damp to-bacco will form condensation products more readily than dry tobacco it is probable, therefore, that a dry or elgarette gives off le es poiso

than a damp one does, but not averyone smokes from

choice a new cigar or an old cigarette It is reasonable to conclude that able to conclude that the amount of nico-tine reaching the mouth does not neces-sarily depend on the amount in the tobacco, but on the form in which it is smoked In drawing this conclusion regard must, of course, be had to the quantity of to-bacco smoked, but if the conclusion is corcome first as the local ero smoking, then the eigarette, and last ly the cigar -- Lancet.

It has often been remarked that the centers of sciamic and volcanic activity move volcanic activity more
slowly westward is
not yet westward
Physikalische 2 the
chrift, H Webner
shark
should nucleus, separated by a thin stream of liquid
from the auth's crust, and rotative sitelity in surviving

sound nucrous, separated by this airctum of inquis-from the earth's crust, and rotating slightly less rapidly than the latter According to Webner's calculations, the nucleus makes a complete revolution, relatively to the surface of the earth, in 862 years. (There is room the surface of the earth, in 862 years. (There is room for a good deal of uncertainty in such calculations.) Webner supposes, further, that the nucleus is studed with protuberances which are conters of activity and that these protuberances, coming into contact with weak parts of the sartile crust, cause earthquakes and volcatic cruptions. From this theory and the records of earthquake ablocks observed by navigators of the rocamic eviptions. From the theory and the separation of the Atlantic Cosm during the last sixty pears. Webser concludes that a group of these dramsfadle proximents on the children was a revealed to the control of th

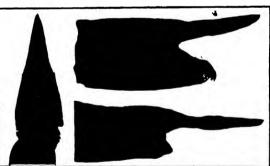


Fig. 2.—Heads of two species of gobils abark The lower one is that of the newly discovered Jordan's poblic shark (Sospunorhyachus jordani). Fig 8,-Under side of he af Jordan's gobila shark.

THE NEWLY DISCOVERED GORLIN SWARK OF JAPAN.

highest amount of nicotine necessarily tonded to be the most injurious, no mantor in what form it was smoked, but we now know that the form of smoking plays an important part. There was a theory that not in all three cases was the original nicotine in the to the sat three cases was the original module in the tobacco conveyed as such to the mouth, sometimes it was destroyed by effective combustion, while at other times pyridine was responsible for toxic effects. According to this theory which was all on the right track the classrets was least harmful, because the tobacca slower the thin pages various was account. eco slong the thin paper wrapper was expose Freely to the air and as a consequence the tolence was well hurst and all incotins was destroyed Against this it was held that in such a case one poince disappeared only for another one to be elaborated, and aerhon monoride was found in marked quantity as a poisonous constituent of cigarette smoke. As a manPletured in the second

Scientific American



PERFERON ARCH.

panying engraving is an arch Protured in the accompanying organing is an arch used more particularly in freproof work, which is of very simple construction. It consists of hut two titled the provided with an air space usually designated as a "vacuum." The usual I-beams be-



-

tween which the arch is formed are indicated at A and B Each arch member comprises a top panel G, a bottom panel D and a side panel E thus giving the member the general shape of a wedge. At the point of the wedge one of the members is provided with a of the wedge one of the members is provided with a tongue F, while the other member is formed with a groove adapted to receive this tongue. When the two sections are fitted between the I beams they are thus interlocked. A weight placed on the interlocked tiles produces an outward spreading thrust against the two I beams A and B To resist this thrust the I bes are braced by means of cross rods, as indicated by dotted lines in the illustration. Our illustration shows part of the upper panel of one of the sections broken away to reveal the reinforcing which, in this case, consists of a notting of heavy iron or eleel wire im-bedded within the material. The lower panel is bedded within the material 'the lower panel is braced by means of bars of inhedded therein which ex-tend up into the tongue F. They take the end thrust and materially attempthen this portion of the arch The 'vacuums' or wedge-shaped air squees formed be-The vacuums or wege-shiped are spaces formed to through the arch in case of fire. A building having a large proportion of such arches is therefore to that extent rendered more nearly dreproof than would otherwise be the case. The inventor of the arch is life Eugene F Fitzpatrick, of 158 Withers Street,

MUFFLER FOR TELEPHONE TRANSMITTERS.

Unless one is using the telephone in a booth or in a quiet room it is impossible for him to exclude all local disturbing noises by stopping the cer that not applied to the receiver, for the reason that the noises reach him by way of the transmitter of his own instrument in order to eliminate all auch dis-turbing sounds a very simple device has recently been od which may be applied to any telephone tran mitter This device is illustrated in the accompany ing engraving it is extremely eimple, consisting of two members hinged together, one of them being a ring-shaped plate adapted to be placed over the mouth of the transmitter and provided with ears which ar bent back ovar the suiside of the transmitter of wire band is then fitted over the ears, and the latte are bent upward and hooked over the wire. Owing Owine



MUTTER TOR THE PROPERTY PRACTICALS.

to the outwardly flaring form of the transmitter the device is thus firmly made fast. Between the ring-shaped plate and the transmitter is a strip of felt which serves to prevent vibrations that strike the which serves to prevent vibrations that strike the plate from being communicated to the mouthplece of the transmitter. The second member, which is hinged to the plate, is in the form of a flat cover provided on the inside with a lining of fait so that when it is closed down upon the other member it will exclude all sound from the transmitter. The hinged cover all sound from the transmitter The hinged cover is provided with a finger place, by which it may be opened whenever one desires to use the transmitter but at all other times it should be closed to orticale local noises. The inventor of this simple attachment for telephone transmitters is William D Plumb, 2022 Lexington Avenue, New York city

WROUGHT-STEEL SASKES.

in this the sanitary age we have come to recognize in this the santary age we have cont. to recognize
the importance of daylight is our work rooms as
well as in our homes. The germicidal effect of sun
light is well recognized. Add to this the fact that
gartificial light costs money, while aunight is free,
and nothing further need be said to demonstrate the superiority of the daylight shop, both from the sanitary and the economical point of view Recently a new tary and the economical point of view "sceenity auctivity type of window sash has been devised for industrial huildings, which, it is claimed, by doing away with the cumbersome frames and heavy mullions makes it. the cumbensome frames and heavy mullions makes it possible to deliver 25 per cent more light through a given opening than heretofore. The sash is of vary simple construction, and yet is much atronger than the common wooden sash. It is better able to with the pressure of the wind, and furnish to a fire It is made of steel bars rolled to the cross section shown in the accompanying engraving. The method of joining these bars is very ingenious and decidedly unique. A small cross slot is made in the



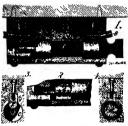
HOVEL JOINT FOR WHOUGHT-STEEL SASHES.

vertical bar (Fig. 2) of the such just large enough to admit the finance of the horizontal bar The moiries part of the vertical bar a them pressed out so as to folds tosety around the moided portion of the horizontal bar, as shown in Fig. 3 in the latter bar a small notch is cut as indicated in Fig. 1 to set as a tock It will be observed that the amount of merid loved in making this joint is infinitesimal bars run without break from top to bottom of the win dow as well as from side to side, making a particularly strong framework, and this permite of using a nuch strong framework, and this permite of using a much lighter section has in possible with a miter joint con struction, so that a great saving in effected in the utilization of the sanh Furthermore, the unusual type of joint makes a break in the monotony of the window sanh which is pleasing to the eye. A patent on this type of sanh has been secured by the Detroit Steel Froducts Company of Defroit, Mich.

SAFETY FURE BLOCK.

Heretofore when fuscs such as the screw plug, ordinary cartridge, or the open wire type, have been used, it iss been customary in making temporary installations, requiring a larger capacity than supplied by the block used in the original installation to remove the original fuse, and to substitute therefor one of larger and in many instances of a dangerously large carrying capacity This has resulted in permitting a load to be intro-duced on the wires which has taxed and in some cases queeq on the wires which has taxed and in some cases broken down the insulation by heat, resulting often in producing a dangerous fire. To obviate such possi-billities the fuse block illustrated in the accompanying engraving has been deviced. It is so arranged as to prevent the introduction between the terminals of a a fuse having a larger carrying capacity than med for the time. The block A as shown in e of a fu

Fig. 1 is provided with a cylindrical compartn opens at one end into a recess B and at the other end communicates through a partition I with a recess ead communicates through a partition I with a recess O. Bach recess is fitted with a lug adapted to receive the terminal wires of the line. The lugs are engaged by screws that pass through the blocks and serve as binding posts to hold the line wires. The lug D in the recess B is provided with spring clips of accurate adapted to grasp the body of the fuse E for P in the opposite recess is also provided with



SAFETY FURE BLOCK

spring clips adapted to engage a boss G which pro-jects from the end of the first. The fuse is provided with the usual metallic contact bands and one end is furnished with a handle H. All of the fuses adapted furnished with a handle H. All of the tuses anapted to be used with a block of a vertain ampere carrying capacity are fitted with bosses of the same size. A fusc of larger carrying rapacity however, would have a boss of larger diameter—if one should attempt to hasert a fuse of larger carrying capacity into the block the boss would fall to pass through the partition I and enter the clip P as shown in Fig 2 and no contact would be made with the line terminals. The inventors of this electrical fuse block are Messrs. A. A. Moffill and G. E. Andrews, of 40 Bridgham Street, Providence R. 1

AUTOMATIC STOCK SALTING DEVICE.

Cattle when housed or running free in a field nee a finited supply of sail to maintain them in good condition if the sail is placed in troughs mixed with feed some of the animals will prevent others from getting a projer amount of the sail. The necompanying engraving limitates a device which affords free access to the sink for obtaining the requisite amount of sali and at the same time protects the sait from the of sail and at the sains time profest is the sair from the elements and prevents want it it is the profession of a und-shaped receptarie which is hemispherical, as indi-sated at A in the illustration A cover piece B is secured to the receptate A by means of servers which are threaded into lugs C formed on the member B l'ile pover piece la aiso hemisphericai in shape, but is cut away at the forward side to admit the muss is not away at the forward side to admit the muzzio of the autimat. A hood D is hilipsed to the cover B and sorves normally to those the opening in the latter At the forward side of the hood is a lip E which pro-jects forward and is curved upward. The receptacies jects forward and is curved upward A is provided with a similar lip F, which however is curved downward thus leaving an opening which will exceed the sait and attract the stock. In use a sufit number of the sait holders are placed in the neight number of the sail noncers are quarcu in the corral or the flith where the stock range to enable the cattle to obtain the sail. The animal raises the hood by showing his muzel beneath the lip E and rocking the hood back until it enanges a long U. When the animal withdraws his muzele for the sail holder the bood will close by gravity thus protecting the sail from exposure to the elemente. Messrs Frank and Thomas L. Peifer of Beason till (R. F. D. No. 2) recently secured a patent on this salting device



AUTOMATIC STOCK-SALTING DEVICE.

RECENTLY PATENTED INVENTIONS. matical or popular in their tre-

RECEIVED PATRISTED INVESTIGES.

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Of Interest to Farmers.

of Justerest to Farmers, INTF J W MATTHEWS, Hardy, Tra This invention & an improvement on the former patent granted to 'W Matthews and precides a durable farm gets which can be opened and shall from positive remot from the gate itself It is positive in operation and requires the agentiture of little effort in closur or open it the gait being operable, for example, by the second of a rebiel.

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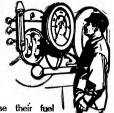
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TABLES 21) STEEN CHILDRES

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NEW YORK MATURDAY MARCH 5th 1916

The Ration is obvey which to receive for continuous distributed articles an object of timely interest. If the photographs are sharp the articles about nod the facts authorate the contributions will receive special attains a prepared articles will be paid for a templar apie.

A TRIBUTE TO AMERICAN SHIPBUILDING

LTHOUGH the general public bas apparently falled to approviate the significance of the recent winning of a \$22,000 000 order for but ileships by an American shipbuilding competition with the leading yards of Great Britain, France Germany, and Italy, the Importance of this

France Germany, and (tally, the importance of this matter is fully appreciated abroad.

The facts are as follows. About one year ago the Argentine government asked for proposals for two first class baltiships, and it requested four American firms and all the leading for ign shiphulders to can arms and an internal manage for year as input in bids on the contract. The plans submitted were not accepted. The Argentine Commission then prepared its uwn specifications and asked hids from a selected number of these contractors. On the receipt of the second but of bids il again narrowed the comor the second let of plus il again narrowed the com-petition down to one American firm, the Fore River Company two English firms Vickers Sons & Maxim and the Armstrongs and one company each from Gr many, France, and Italy As a result of this lead com pelition the award was given to the Fore River Comp on designs and orice submitted by President Francis T m, formerly Chief Naval Constructor of the United States navy One of these ships will be built at the Fore River yard and the other by the New York Shiphuliding Company

dging from such particulars regarding the design Judging from such incliculars reparding the design of the vessels as are available, they still be the most powerful fighting ships affoat at the time of their sumch Although in displacement they will not exceed our two latest battleships the Wyoming and 'Arkan as the disposition of their twelve 21 inch guns is such that they still have a rounderably more powerful concentration of few ou every point of bearing accept This advantage is secured by placing the two amidship turrets in delicion ur diagonally, an arrang ment which permits the four guns in these turrets to end shead or dead natern as may be de sired Since the four 12 inch guns in the pair of turrets in the bow and at the stern can be trained axially, this ship will be capable out only of concentrating all twelve gins on either broadside as will be done by our rew'Woming (lass, but also (ight gine dead abese and eight dead asiern as against a fire of four ahead and four asiern for the Wyoming 'The beit is to be 10 tunnes in thickness and the speed 22 knots Apparently, unless some other features of the ship have been sacrificed this vessel represents the highest de relopment of offensive power yet attempted in the history of wacahip construction

That the Augustan tender was lower than that of auch firms as Vickers and Armstrong is explained by the fact that armor plate and the steel for the hull construction can be obtained at a lower price in the l'uited Sinics than it can alroad, the difference in this regard being so great as to more than offset the high cost of American labor. Whatever be the reason for our success, the fact remains that the plac-ing of this large contract with an American firm adds. greatly to the presilge of our yards and testifies to th high point of excellence to which warship construc-tion has been corried in this country. In this connec-tion we may as well draw attention to the fact that the apathy of the I nited States to any proposed meas ures for the respectation of our merchant marine has reduced the construction of merchant vessels to such a low point that our leading shiphuliding vards are a low point that our leading supplified yards are to-day kept silts almost sulfrely by gos rument orders for work. Nor must it be argued that the securing of this large warship contract proves that there is no necessity for government assistance in the uphuliding of our more hant marine, for the question of the sales ent cost of running a merchant ship, which is much

higher in the American than to foreign service, d not enter into the consideration of warship construction Moreover, the competition in the construction of merchant steamers is much keener and the prices are rela-tively lower than for the construction of warships

COULD THE BARTH COLLIDE WITH A COMET?

N May 18th next the earth will be plung into the tall of Halley's comet head of that body will be but 15,900,000 It is but natural that a think miles away it is but natural that a think-ing man should ask is there a possibility that tho carth may encounter a comet and thus come frightful and?

enough, it was Halley himself who first pointed out the possibliity Whiston Newton's successor in the Lorasian chair of mathematics at Cambridge was so starmed at "n charlot of fire' which flared up in his day, that Halley was prompted to look closely into its movements. His work led to the startling re into its movements. His work led to the startling result that the control, when passing through the deserred top node land suppresshed the earths path within a cuil diameter, of the earth. Saturally, Isality so nevel what would have happened had the earth and the count-been actually so clean together in their specific works. Assuming the count-to-mass to have been comparable with that of the earth tan assumption which we now know, to leave here siterify beyond reason) he concluded that their mutual gravitation would have caused a change in the position of the earth in its orbit, and consequently in the length of a year. This train of thought hed him to consider what the result of an actual collision would have been, and he concludes that if so large a body with so rapid a motion were to ririke the earth-a thing by no means impossible—the shock might reduce this beautiful world to its original

Hence liailey not only dispelled the supersti the terror which once followed in a comet s wake, but also pointed out a possibility which the superstitions Dark Ages had ever dreamed of the scened to Halley not improbable that the earth had at some remote chilquely had thanged the position of the axis of rotation, the north pole having originally, he thought, been at a point not far from Hudson e Bay The more recent investigations of Kelvin and Bir George Darwin Sime Halleys time the chance of a collision be

tween the earth and a cumet has engaged the attention of many astronomical mathematicians laplace, for example, painted the possibility of a collision with the carth so vividly that he startled his day and generation ite drew a phture of a comot whose mass was such that a tidal wave some 13 000 or 14,000 feet high inundated the world, with the result that only the higher peaks of the Himalayae and the Alps protruded Lalande created a panit by a similar consideration of the subject er which was intended for presentation before the Academy of Sciences, but which was not read the Asademy of sciences, and which was not read Such was the popular excitement, that he felt himself constrained to nilay the public fears as well as he could in a scothing article published in the Clasette de France The masses assumed by both Laplace and La

France 'ne masses assumed ny boni Japane ani ja-lande are so preposterona that their liberies are no ionger seriously considered by any same astronomer Since the day of Lapines and Lakinde there have been several comet "scares" Bielas comet crossed the varita orbit on October 29th 1832 When that fact was announced, Europe was In a ferment. The orbit of the carth was confused with the earth ltscif was the popular excitoment, that Arago took It upon himself to compute the possibilities of a collision He pointed out that the earth did not reach the exact spot where the comet had intersected the earth's orbit nntii a month inter, on November 30th, on which date the comet was 60,000 000 miles away incidentally he the comet was 60,000 000 miles away incidentally he pointed out that a collision was always happilly remote. He thought that the chances of a meeting were about one in 281 000,000 Babinet, on the other hand, thought that a collision was likely to take place once in about 15 000 000 years. More recently the au-tire problem has been considered by Prof W H Picker ing of Harvard By a collision he understands, first, that any part of the earth atrikes any part of the concts head, second, that any part of the earth atrikes the most condensed point in the head (the corel as distinguished from the larger nucleus. What the average size of n vis this comet's head may be, we have no age was of a visinise coincid nead may be, we have no means of knowing. Young estimates that for a telescopic come! If averages from 40 000 to 100,000 miles in diameter. The head of the great comet of 181 miles 1 200 000 miles, that of fiolime's comet in 1882, 700,000 miles, and that of naked-eye comets senorally over

In the isst half of the iast century 121 comets in cinding returns penetrated the sphere of the earth's orbit From this Prof Pickering infars that we should expect to be struck by the core of a visible comet once in about 40 000 000 years, and by some portion of the head once in 4000 000 years. Bince comets' orbits are more thickly distributed near the scliptic than in other

a of the aphare, the collini more frequently than this, but hardly as often as ones in 2,000,000 years, and since it has been estimated that animal life has existed upon the earth for about 100, 000,000 years, a considerable number of collisions, perout, our years, a considerant unmore or consistent, per haps as many as fifty, must have taken place durin that interval, in Prof Pickerings opinion, evident without producing any very sorious results. The old notions of the tidal effects of comets were

based upon an erroneous conception of comelary masses. It seems astonishing that a man of Laplace's masses. It seems automining that a man or respon-wonderful mathematical powers should not have con-cluded that a body like a comet, which can sweep through the entire solar system without deranging a one of its members, must have a mass so s that it cannot appreciably affect the waters of the earth. As it is, concess are more likely to be captured by planets (witness the comet families of Juniter and Saturn) than to derauge a member of the solar aye or to produce tidal effects

plunging of the earth in the tail of Hall of unturally causes many to wonder what will be the effect upon the tobabliants of the earth Similar passages occurred in 1819 and 1861 but no one was the planages occurred in [8]9 and [86] but no one was the where until long after 8 mom autonomers (alimed to have notived auroral glares and meteoric displays at the time, but whether these were really associated with the council or not annot definitely be stated. At with the council or not cannot definitely be stated At-all events, it may be safely held that on May 18th next-tone of us will be aware of the fact that we are literally breathing the tail of Halley's comet From this it may well be inferred that the wild taims of the possible reflects of poisonous gases, tales for which the news-papers are very largely responsible, are utierly without foundation it is true that a comet's tail is composed of poisonous and asphyxiating hydrocarbon vapors and or poisonous and sampyrining hydrocarbon vapors and of (yanogen, but it is also true that the actual amoust of toxic vapor is so small that when the earth is brushed by the tail of Hailey's comet, the composition of the atmosphere will not be so affected that a chemist could detect it Flammarion has drawn a vivid picture in his 'i.a Fin du lionde" of the possible effe passing through a tall highly charged with vapors. its death struggle with carbon monoxido gas, killed off with merciful swiftness by cyanogen and dancing joyously to an anæsthetic death, produced by the or sion of the atmosphere into nitrous oxide or destist's langhing gas." No one of any common sense should ed by these nightmares particularly when it is considered that so diaphanously thin is a come isil, that stars can be seen through it without dimb

PATRIT COMPLEXITIES IN GREAT BRITAIN

Y the course of a judgment in an important patient has before the liouse of Lords, the supremular irihund of Great Britain, the Lord Chancol for made wry judinted reforences to the complexity with which patient specifications modifies oncumbered During the past few years here has been as increasing tendency to render anche specifications as juricate and as voluminous as possible, thereby obsaving the vital issue. Only a few weeks previously the Chancellor complained in another action of the manner in which claim and narrative had been so intimately interwoven that con the had been so intimately interwiven that consider-shed difficulty was experienced in unraveling the real factors in the issue Such a tendency, the Lord Chan-cultor pointed out, defeated its own object, for whare patent specifications and claims were so framed as to puzzie a student, business miss were atraid to take out a license for its working, for fear their interpretaout a license for its working, for fear their interpreta-ltun of the patent might be found to be erronesens, be found guilty of infringement, and be mulcted in heavy demages. The particular case in which the Lord Chancellor was constrained to make these comments was in connection with improvements in the casting was in connection with improvements in the castring and trimming of stereotype plates. The court contended that the specification of the original patent was extremely voluminous and complicated, amounting aimout to the built of a treatise, in which there was infinite redundancy and reportitions, and constant references to illustrations which were conservable difficult to failure it was a document which needed a facility to failure it was a document which needed a possible of the content of the co lar field of industry might know how to avoid all pos

In the course of his remerks the Lord Chancellor In the course of his remarks the Lord Chancestor pointed out that inventors who drew up auch compli-rated claims must run the risk of the whole patents aboung declared void by the court on the place of an-higuity. The framing of specifications in this man-ne he declared to be an abuse of the law, and he gave the warning that it would be checked, if the occasion arose, by the simple process of declaring the patent invalid. These timely remarks have been patent invalid patent invalid These timely remarks have been creatly appreciated by British commercial and manu-facturing establishments, and there is no doubt that advantage will be taken to draw up specifications in a more concise and incid manner.

Scientific American

ENGINEERING.

The Cheests medal, founded by that celebrated apear, Catrac Channte, and avarded by the Western Society of Engineers for the best paper presented during the year, has been given to Prof Talbot', University of Illinois, for his paper entitled "Ivets of Cast iron and Reinforred Concrete Cuivert Pipe," which mobiled remains of a research extending over a number

The Enterests Commerce Commission points with pardonable pride to the saving of life and limb which has resulted from the operation of the safety applinace law In 1890 one out of every 348 men employed in car coupling was killed, and one in 13 was injured, whereas in 1809, one out of 58 was killed, and one ent of 62 was injured—an.increase in the factor of matry against death of 1816, and against lujury of

In addition to the three dreadnought bettleships which are being built for the Braillan mavy, the programme of construction includes ten descriptes of the stanks segging type being built by Meser's Yells are in commission and the seventh recently accessed her speed of 27 knote during trials on the Cyde, carrying a load of 100 tons. These ressels are 340 feet long and they are proposited by twin reciprocating ones of 5,000 homes-purer.

Mon 3. Arnold has been appointed univery engineer for the city of Chicago, and it is probable that about nine miles of subway will be put under construction forthwith. The city has and itself rands for this purpose from its accumulation from the street railway company dividends, and the artect-ear companies are bound to contribute \$1,00,000. The term section will be considered to the contribution of the contribution of the term of the contribution of the term which laier construction will radiate.

There is now a significance in the recent expirer with the German of several big contraval in this century the German of several big contraval in this century the third of the contraval of the

These is much talk in the air about the construction of a 30,000-ton healtiship for the influid States may and its cause is to be found in the advent of the new and very powerful i-fine ign, which re-cently underwast successful tests at Sandy Hook. If the i-fine is to remain the same as in the "Wyomina;" an increase in displacement becomes necessary Indeed, it is questionable whether even a 30,000-ton ship could mount twelve i-finely gauss and give them adequate mount twelve i-finely gauss and give them adequate

Only these who have witnessed the great consention on the present sulway ran understand the snaperestifaction afforded by the determination of New York citify wary efficient Mayor and the Public Borrico and mission to build at once an additional system of saways at a cost of 490,000,000. The rootes include an entirely new north and south subway from the Broat to the Battery by way of Latsipton Avenue and Broadway, and a subway in Brookiys connecting the lines over the Williamshurg Bridge with the new Fourth Avanne route in Brookiys, the latter to have elevated extensions to Port Hamilton and Coney Island

The Federal authorities have approved of plans for the opening of the Delaware River to a navigable depth of 15 feet as far as the city of Trentos, and it is believed that the development of deep-water navigation farther inland will be only a question of time. It betures extipendous work of this character has been done which has made the city of Manchester a seaport, while believe in German, 10 on this from the mouth of the Rhine, and Cologne, 150 miles from the mouth of the in free communication by water with the subboard.

Mr. George Gibbs, Chief Engineer of Electric Traction of the Pennayirania Trannal and Torninal Rail model, in a report made at the last sensition of the Interaction, and the Pennayirania Transis and Torninal Railways and the Long leads Railway on the Long leads Railway on the Long leads Railway operated by steam. During 1986 the Long per say mile as against a cost of 97.55 cents for steam per say mile as against a cost of 97.55 cents for steam per say mile as against a cost of 97.55 cents for steam retina milages, On the West Leway and Seashors the cooks were 80.66 cents for electric in as \$17.55 cents for steam for allowed the cooks and the same service of the Long Interaction and the steam service to the total state railway are accounted for matiny by the cottant stops were proposed to the Long Interaction and the steam service to the Long Interaction and the steam service the total state of the control of the per fines per fines tracks are such as a composed of the Long Interaction, and therefore of an exceptionality consequence of the steam services and the steam service the service control of the service was empress.

ELECTRICITY.

The first Edison medal of the American Institute of Electrical Engineers was awarded to Prof. Elihu Thomson for his achievements in electricity, on the occasion of the anniversary dinner of the institute This medal was founded by friends of Mr. Edison, and is intended to commemorate his work

A remarkably long wireless transmission was recarly recorded by the steamable "Tennessee," five days out from Honduits, which succeeded in catching a message from Table Bluff on the coast of California. The message was a weather report, which was after ward verified by the Navy Department. The distance of transmission was 4,550 miles.

A recent test of wireless telephony was made to show its value for transmitting music. Several selections were using in a transmitter a Pert Avenue and Fortleth Street, New York, and wore listened to year group of newspaper men at the Motropolitan Tower At times the singing was very clear, but frequently was impossible to hoer surpting but a confused but

A portable transformer drying apparatus has been devised to dry out transformers that have become moist during shipment or storage. The apparatus consists of a furnace dasplet to hurs wood or charcest A current of air heated by the furnace is forced through the transformer by means of a blower driven by a small motor. The air, before runching in blower, is filtered through several tickinesses of

The kalephones used on the ateamably "Institution are quite interesting. The induction coil condensor, and beli of the instrument, are inclosed in a small white enamed box, and the switch book with project from one side is provided with aspectal retaining de the top the present the receiver from being knocked of by the protion of the ship. The receiver is allowed in risk in the book, otherwise the lover yould lift and not allow the condition of the ship was pitch him and rolling.

A recent number of the Electrical World described a very interesting electrical installation on an illustration of the power plant consists of a gas-producer in salatinton supplying a Si-horse-power two-yristed gas engine to which a t-&ilowatt 155-wit drive-tear-prospective products of the betted. The outgreat generator is betted. The outgreat is used to light tolk lamps, which are used in the family residence, and a tenant house, as will as its various barne, core rivins, and other buildings.

A new type of tomedistance telephone was recently rested successfully over a ricuit; estending from New York's Chicago by way of Pittahurg, and return The International Control of Dr. Tardisu of Aries France consists in lexisting the pitth of the measure two ottawes and a third by means of a combination of drams. At this high pith the waves are sharp and short, and roub instructed over a greater distance than is possible to the control of the control o

At a revent meeting of the fundature of Electrical Kingineers in London a differential vietric thormon eter was described by Prof J A. Plening: The ther memorate ronalists at two large flast tubes, seeled air light at the lop and bottom and connected by a cube of fine hore is which is a thread of relored water conference of the control of the conrol of the control of the frequency current while the other is connected with a source of direct current. By introducing resistance into the circuits, the heat may be regulated until it is the same in bott tubes, as will be indicated by the hubble constituting in the center of the small connecting is the same in the control of the current.

A report on the trackines trotler gratems near Vicuni has recently been made by the United Battar Consul General there situated "The current collector used consist of a small farms supported on the growed wheels which run on the positive and negative wires. The wheel is prevented from jumping the wires by a weight of pendium. A cellsh or shout 10 or 11 years connected months of the state of pendium and the collection of the property of the pendium and they can be the same interchanged, and they can proceed on their way. This is an improvement over the track system with turn-outh at various points, which make it necessary for the first car that reaches the termout to wait until the second car arrived. The total running cost of this system for a car of the control of the system for a car of the control of the control of the system for a car of the control of the con

A five-mile test of the Edison Beach storage battery car was made here last week ovar the 28th Sitrect horse-car tracks. The car carried a number of engineers, who were to judge of its availability for streetctar service in New York. If their decision is favorable Eftess of the cars will be put leto service.

SCIENCE

Dr. E. B. Bannard of Verkee Observatory seemed photographs of Comet at 1910 on January 2 ist, 24th, and the Phornary 1st, 3rd, 4th, and the Cloudy weather prevented the taking of any other photographs. Dr Barnd Infarms no that one of the Interesting features of this comet was an extension from the bend about one quarter of a degree long toward the sun. This extension was in a line with the prolongation of the southern edge of the tail

The mechanical laboratory of the Polyrechist institute of Worcesier, Mass, he undertaken a study of the relative thermal ronductivity of rolled copper and of copper deposited by eite rivoysis and not rotted The conductivity of the rolled copper was bound to exceed that of the sincribytic copper by 30 per cent. This is an interesting instance of the change in the control of the conductivity of the control of the changes in the control of the change in the changes in the control of the change in the

Gobalt and tis, in the liquid state, are miserible in all preportions, but solid evident dissolves only about an all preportions but solid evident dissolves only about an observation of the control of

Burspean aportamen are beginning to fear that game will be made scarce by the multiplik attor of accordance will be made scarce by the multiplik attor of accordance and the scarce by the multiplik attor of accordance with the scarce and scarce and the scarce an

One of the actentite developments of recent years has been the formation of instrumentional congenitations for the remaideration of the programment of the remaideration of the programment of the remaideration of important uniberts. Interest content or congress in acology in themsilery is modified and in other subjects moved at regular intervals usually every times years, for the purpose of freely site unstage the problems of their specialists. Those have remained in international committees. Thus it imposes that a special committee on other redistinct. The deviation is a special committee on other redistinct. The deviation of the comparison of observations in solar radiation. The deviation particular of observations in solar radiation is obvious in the forest that the C of Abbot, director of the finitiannian Astrophysical Observatory has succeeded in perfect in the construction of an instrument used to the construction of an instrument used of the construction of the construction of an instrument used of the construction of the construction and at Month vilkons in california have been fround in yield assistancery results. A limited grant from the indepths are not only the construction of the Percent government will be seen to be located to the construction of the Percent government of the percent government of the construction of the Percent government of the percent governme

TWO REMARKABLE SHOWS

NOVELTIES IN MOTOR BOATS AND AEROPLANES

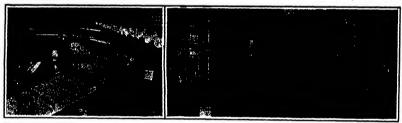
was that of the Electric Launch Company of Bayonu

The slith annual motor boat show to be licid in N J in addition to an electric launch having a radius Maddoon Square Garchin opened on Firmary 19th and of 100 miles on one charge, this company showed a linked one week. The show this system was begreat that 21 foot memberary radius from the results of the state of th 21 foot makegany yachi (tuder filted with a 40-horse-power gasoline motor and capable of a speed of 22 miles an hour, a larger boat filted with the same size motor and having a speed of 18 miles an hour, and a \$5 foot cruft filted with a 6-yiliner 60-horse-power motor and capable of a speed of 23 miles per hour with six or eight passeragers 1 he most pretentious 'bleo' was a high-speed 64 foot cables insuch fitted

with a 60-horse power 4-ydinder Standard motor, and capable of a speed of 15 miles per hour. This beat has a large open cockyli for an and aft for fair weeken, and a spatious cabin amidahipa. The engine is placed forward in a separate compartment and in a placed forward in a separate compartment and becomparting the placed forward in a separate culture recomparting by side. Other firms exhibited cruthers comparting in size to the beat just mentioned and fitted with all the convenience meeting of the convenience needed on this type of craft (Continued on page 200)

l'authan's Langley type prize-winning model scroplane

General view of Boston Aeronautic Show; Monoplane Exhibit



Interesting full-size Aeroplanes exhibited at the Boston Aeronautical Show

The novel L. A. W. hipians, with its revolving cylinder, air cooled \$-cycle motor. The heavy curves and construction of the planes is a noticeable feature.



General view of the Sixth Annual Motor Boat Show in Madison Square Garden, New York.

TWO REMARKABLE SHOWS.—HOVELTIES IN MOTOR BOATS AND ARROPLANDS.

RAPID PROGRESS OF THE NEW YORK STATE BARGE CANAL

A RECORD OF RECENT ACHIEVEMENT

The large amount of work done on the New York State Barge Canal during the past year augurs well, not only for the completion of this great work within the contract time but for its being done within the estimate of total cost of \$101,000,000. Almost as much romatruction work was compitted during the

aggregate of the work under contract is \$14,18,729. It is satisfactory to know that this has been ascentially allowed as assign of \$2.570,200 were the estimate of 1903 for the same work. Construction work to twalse of more than \$16,000,000 has been done nearly one-balf of it during the year 1909, fiften and of the

ing Lake Eric at Buffalo at an electrion of 16.5.6 for above sea level the new canal fullow the Ningtin River for Tomasanda Prek and those removes extent to the Owengo River and to a junction with the Hudson River at Waterfeed After rate ring, Tomasande Creek It follows the strain to Lackient where a discover as





View of lock No. 5 at Northumberland

One wall of a lock, showing massive character of the concrete mason;





Erecting the lock gates at lock No 11 at Comstock.

A section of the completed canal at Willer





Laying the concrete floor, lock No. 12 at Whitehall.

Another view of Comstock lock No 11 showing retaining wait.

PARIN PROGRESS OF THE NEW YORK STATE RANGE CAMAL

year as was accomplished during the whole period of construction preceding, and the plans that were worked out to completion equal 80 per cent of the amount of similar work done in any previous two years, that in, if we consider the mileage and the size of the esti-

On January 1st, 1910, some 314 miles of the canal, or 75 per cent of the entire work, were under contract, the ramainder of the plans were nearing completion and will soon be ready for letting, and the

fifty four locks are practically completed, and by the spring of next year the eight moveble dams of the Mohawk River will be in operation. The work has now reached a stage where it is possible to predict both the time and cost of the completion of the entire

By studying the accompanying map, profile, and cross sections of the canal in connection with the following outline of its principal features, an adequate conception of this great work may be gathered. Leav-

ment of 191 for 1 is minde by means of two looks the nother be a 60 mile for 1) of Rochester. Beyond (tools for the new and coincides with the init in init and it it enters the Rive Cipie mear Lyons. Beyond two looks the old canal rends be absoluted and a no wonty to laid to the north of the old work. The Lipid River laid to the north of the old work. The Lipid River has been and foreign and the control of the where the Servers and foreign and to for our the cowers River. A new attention of and will be found in the bed of the river running north to Lake Onizate, the

doph of the river being forceased by the use of fixed dams. From Oswago River the canal extends enterly following the river to and across Cooledia late and the cooled of beyond Fort Edward it will be on an entirely new location making entry into lathe Champlain through Wood (resk with be with be canalized by the use of fixed draw. The Casactian government has plasmed fixed draw. The Casactian government has plasmed feet from its mouth of the rev canal through Lake Champlain to Moutreal. Naturally a work of this magnitude passing through an unfolking country and through several important rittle involves an immessa amount of structural work in the way of demn locks hridges and other masonry

and steel work There will be a total number of fifty four locks whose lift will vary from 6 feet to a maximum of 40% feet these taking the place of the sever two locks of the old canal All of the locks will 47 feet wide with

workable a works now length of from 300 to 310 feet. The masonry work throughout The masonty work throughout the whole canai will be of con-crete All lock gates will be of steel electrically operated For the control of rivers and streams and the impounding the impounding of water for sum mit supply there will be thirty fiv dams of the fixed and movable

The total quan tities of excava tion and construc-tion are necessar tion are necessar fly very large in cluding in round numbers 58 000 600 cubic yards of dredging 57 000 000 () h i c yards of earth excavation, 11 000 000 cn hic

900 000 c n h i c yards of rook ex cara**ion and about 10 000 000 yards of embankment and back filling making a total of about 133 000 000 cubic yards In the masonry structures will be four and a quarter mil lion cubic yards of concrete The total length of the

lion cubic yards of concrete The total length of the canal is 42 mile at 18 mile. The Lagistature in 1900 created a Canal Terminal Commission whose task was to impact the canal har bors connected with the Barge Canal as well as harbors where canal freight is either elloped or delivered and to report to the Lagistature their indings we hap to give a digest of this report in due course in the rolumns of this journal. In this connection it so of interest to note that the interest of the Federal to of interest to note that the interest of the Federal large ferminal harlor in Januales Bay with entrance channels at uniform, seemed to the commission of the co channels at sufficient depth to accommodate seagoing vessels. This improvement will have an important bearing on the question of canal terminal facilities.

The Anthrocite Coal Bods of Alaska,

The extent of its gold and copper deposits has given Alaska its principal reputation for mineral resources. The quality at dares of these ores have called public attention to the not the neglect of other minerals and the bulk of the mining in the territory has been done

the puts of the mining in the territory has been done to separe these owns Consequently coal mining and humbering are purel all tundeveloped industries. All histories the predictat and mineralegate have been in ignificant the product and mineralegate have been in legalifying Alaska for a period of years most of or only how the product of the region along the contild the fact, tory interwered parallely regions to the product of small and the fact, tory interwered the distillative of small as

ing and mapping the interior and especially the tipeth-cro portion of Alanka, accurate intermation of its misi-eralogy; is available to be a small fraction of its misi-eralogy; is available to be a small fraction of its mis-less. The contract of the contract of a contract of a small free however the study of the formation has been to thereugh that the existence of very large de-posits of coal has been revealed and accurate out matter made showing the locations of the visus also the thickness while the quality of the foul has been carefully analyzed by adaloptes tates. It may be able that the conclusions of the United States Geological Surrey agree with the reports of experts who have been sent to Alanka to get data for mining and invest-ment. commander.

Survey agree with the reports of experts whe axes been sent to Aniaka to get data for mining and investment companies or the coal bearing area has been nearly companies or the coal bearing area has been largely controved in the viriality of the coast, and the report of the coal bearing roots are the first first is another resource of Alanka of great in portance. Though Tertiary coal bearing roots are known to cover a coanderable area in the southern part of Admiratily Inland and on adjacent inlands of coalbeaters Alanka in binchedd coal of this region less little present fuel value. The beds are from a few inches to two or three fort in thickness and the coal is of a low grade ligatitic character. There are to known areas of high-gree coal—the Bering River to known areas of high-gree coal—the Bering River to known areas of high-gree coal—the Bering River known of the coal in the direction.

sensive states. On the the present that their, no issues of transporting this each to should not install the total their section of the control of their sections, but sit have been opened in proposedupies one. The chemical analysis of special trees a large supplies of with positions of the control of the from a large number of veins panetically entire district gives the following results

-2.25 12 0 8 . . --.. . . 0.88 Loyskak mingle Mrw one margin Aleska Prainting or pro-ngo of five and pro-cess Lisbayres, pror-ge Lisbayres, prorage of oterus majrosa. 22 22 神麗 12 -2 C 14 . **4** ts .. e 10 .. -12 20 ...

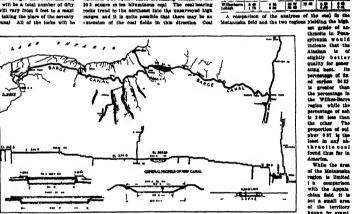
Since the anthracite coal deposits of Per-sould be naturally contrasted with Alsahap sould be naturally contrasted with Alaskap clement some analyses of the more notable

			ALC: UNK		-	-
Pa. Region	Water	Lipdrocerton	Pizel	Factor.	Anh	Salpjray.
Willusbarro	18	Lydrocarbon	22	19 20	1.2	12

indicate that the Alaskan is of slightly better quality for mener ating heat. Its percentage of fix ed carpon 8433 ed carbon 5433 is greater than the percentage in the Wilkse-Barro region while the percentage of sah than the other The proportion of sal phur 0 87 is the least in any abfound thus far in America. While the area

of the Matanuska region is limited in comparison with the Appala chian field it is but a small area of the territory known by commi nation to contain deposits of an thracite and bitu

deposits of an arrangement of the construction and bits arraliable for use by the construction as a many arraliable for use by the construction of a many arrangement of the bods in the continuation of the construction of the construction and the first and the continuation of the bods in the continuation of the bods in the continuation of the bods in the care positively knewn to be understain by could est be earny against influence or understain the continuation of the Paramyriantal influenciar captions arranged to the Paramyriantal influenciar captions arranged to the Paramyriantal influenciar captions are all the Paramyriants and the Paramyriants and the same suitable for use, the limits is constained in our arrange suitable for use, the limits is constained in our arrangement which are all the paramyriants of the caption in the caption of th



Plan profile, and sections of the New York State harge canal RAPID PROGRESS OF THE NEW YORK STATE BARGE CANAL.

beds varying from six to twenty feet in thickness are exposed in this region with some local swellings, giv exposed in this region with some local swellings, giving a much greater thickness. In quality the coals wary from an anthractic with 14 per cent of fixed carbon and include some varieties that vill coals and include some varieties that vill coals are much proporting in these coals but in the absence of railways no mines have been developed though a small oright from the option properties.

the coast in barges

The Matanuska may be considered the most impor

the court in barges. The Manufacture and the scattering of the Manufacture and the Man

Scientific American

Assembly in section of the particular of a rathroad for this field, is a supple in swallpille over which a rathroad in this field, is a supple in swallpille over which a rathroad for this field, is a supple conjurcation over the formation of the champter, it will be shown if the first many and the conference of the control of the first many and the conference of the part because of the treatment of the part because of the treatment of the same set the conference of the part because of the treatment of the largest const carriers can take on cargines at the conference of the largest const carriers can take on cargines at the conference of the largest const carriers can thus on cargines at the conference of the largest const the take on the same threatment of the conference of the treatment in the term of the treatment of the threatment of the term of the carriers of the terminal histories at present overlag to the Congressional threatment of the three tend mineral resources of the terminal histories at present overlag to the Congressional threatment of the three tend mineral resources of the terminal histories at present overlag to the Congressional threatment of the three tend mineral resources of the terminal histories at present overlag to the Congressional threatment of the three tend mineral resources of the terminal histories at present overlag to the Congressional threatment of the three tends of the treatment of the treat

controversy
Coal was found near Cook Inlet by the Russians as
far bank as 1855 but the entire output of the territory
has been insignificant as above by the product of less
than 10 000 tons of all kinds in 1909—none of it anthra

THE " STAR --OUR LATEST DREADSOCSET

TRE "FAME —OUR LATEST DERABOSORS".
The spirited diversing on the front page of this issue represents our latest franchengist the Ulah rocest by issuehed from the yard of the New York Ship betfeling Company Canden N J She is shown stanting in a gain of wrind against. a heavy Atlantic see, and in spite of her great length or Ship feet the bags vessel as also ride of year length or Ship feet the Naga vessel as also rides over the long Atlantic visual will do her full share or pitching and rolling as she timbs and despends see he maintiful see. Several childs lengths to starboard is a steler ship that is running down the slope of a sea whose creet is sufficiently high to hide all but the funnels and masts

to hide all hit the framels and masts. These conditions are no merc creations of the artist s fancy for we have recently seen a series of pictures taken on our facet when it was steaming northward in a heavy gale on the Pacific in which only the tops of the framels and the fighting masts of some of the vessels are visible the ships lying deep in the trough of the waves

But although the Utah in spite of her full load displacement of over 38 000 tons will be to some ex-tent the sport of the elements her great weight and size will make her a far steadler gun platform than is size will make her a far steadur gun plattern than it afforded by the 16 000-ton Connecticut or the 19 00 ton "Maine and herein lies one of the most important advantages of the big over the medium size warship Tre Utah which is a sister ship to the Fiorida now nearing completion at the New York navy yard is 521% feet long 88 feet 2% inches wide and on a normal displacement of 21 825 tons her draft is 28 feet 6 inches At normal displacement it should be explained abe will have a full supply of ammunition plation das will have a fit supply of ammunition plation das will have a fit supply of ammunition. The ship is an entered and improved North Data with 8 feet more beam 1 foot 7 inches more draft and 1385 cone additional despiseament 8 he is excipped with 6 erew Parsons institute of 33 000 bornspower which are designed to give her a contract speed or 30 ft hood is she will carry 300 ince of coal and of 300 ft of 3

water, and of the guns is exceptionally well worked out in these vessels, being in this respect an improve ment even on the 'North Dakota' herself one of the best protected ships ever buik. In the first place with a view to limiting the destructive effects of a torpedo a view to limiting the destructive effects of a torpedo blow particular attention has been paid to the question of collular and compartmental subdivision. Even in the event of most earleus underwater injury such as might be done by a floating mine the ship is able to concentrate on any compartment or set of compart ments such a great capacity of pumps that she would be able by the aid of these alone greatly to mitigate

be able by the sid of those alone greatly to mitigate the effects of such a blow.

The armor plan of the Uluh is probably the most complete and effective rey but upon any ship. The main belt over 8 feet wide has an average thickness antichip of 11 inches Above this is a second best 8 feet wide of an average thickness of 9 inches The forew seturine belt in continuous from sizes to nature lower waterline belt is anothenous frees seen to stero and the upper belt extends from the walk of the for ward to the wath of the aftermost turnst. The turnst of the 13 inte jumn have from 13 to 8 inches of protec-tion. The 5 inch secondary bettery amiddalps is pro-ceeded by 48, inches of amore and a cimilar thickness protects the assemates of the six guess at the bow and stero. Between such pair of 5 inch guess is a spinter hulkhead of 5 inch armor and best of each battery is a fixed guess. The steroid steroid steroid steroid steroid 5 lited guess. To reach the base of the amorbiest is any august profess the second 54g in the of armor-a august profess the second 54g in the of armor-

anest would naw to passe invouge 3 % incress or armor— a superb prote tion. It will be noted that the ship is provided with two of the new lattice work fir control masts with which all our latest ships have been equipped. The handling of the heats is done by two boat granes pin ed abreas of each other one on either side of th after smoke stack In this ship as in all our dream ughts the officers are berthed on the main deck forward below the forecastic deck th crew accommodation being aff This places the officers near the bridge and convenient by to their post of duty

The kest of the Utah was laid March 1 the 1909 so

The lest of the Uth was laid March I th 1903 and that considerably less than a year has slept be tween the laying of the keel and the launch in the stan a year from the present inter if sit goes well this due abily with have her trials a speed in warship meaniration which is greatly to the credit of the New York Shipbuilding Company Parth wing interest will attach to the trials of this vessel for the reason that she will be the first of American battlebilips to be prepolled by 4 screw Parsons lurbines

American Homes and threese for Flaveh
The curved number of American Homes and Gard
ens contains pictures of interesting California bougs
lows costing from \$1000 upward an article of the furmaking of the apartment by a well known author an
article on the interior decoration of the home of
voiced to a propriate wall papers for the various recomvoted to apprepriate wait papers for the various rooms of the house and views of a number of interesting houses abowing interiors exteriors and floor pinals. The fourth prite gardes of the American Homes and Gardens competition is also published the properties of the properties of the properties of the properties of the properties and the properties and an article on the combined for lag bed and storage pill One of the most interesting article of the paper one which is producely illustrated describes the acts gardens of Culifornia. Trimming strong and laws trees a timely subject to well trained by an about partners of Culifornia. Trimming strong and laws trees a timely subject to well trained by an absence of the contracting and the file of the properties of the contracting and the properties and laws trees a timely subject to well trained by an absence of the contracting and the tiles experienced writer The natorio mapsions of the rap pahannock River are always interesting and the filus trations of Kenmore the home of Retty Washington

The the North Dakots and Thisware the Utah carries ten 13-inch game in the main battery. They are mounted in pairs in bismoot turned the district are mounted in pairs in bismoot turned the district and the little present the six of which is shown very clearly in our engraving of the six of the si

Correspondence.

EOW TO MAKE THE 'ALABAMA AND MAINE"

To the Editor of the Scientific American
As a reader of the Scientific American I am per ticularly interested in the articles on the na

ticularly interested in the accuracy we wanted with one know through your paper why the follow I wish to knew worth on the practical in remodeling the battleships Idaho and Mistastepio Barring finalized the results gained by adding 30 feet in length to the Maine class ever the Ohlahoma w which equals yellow the considerable when the property is the property of the

6-ink guas with ammunition and 400 tons or coal.

I would out these ships in two just aft the boiler rooms and build 30 feet keeping as near the same beam as cossili 77 feet. This 30 feet woold be used.

beam an coastld 77 feet. Ihis 30 feet would be used almost entirely for boilers engines and coal. I think that another set of boilers could be installed adding one half to the boiler poor 7. A new set of on gines would have to be built to handle the 150-borse power that developed and it think that the spood would be raised at least 11/4 knots not much of an an would be raised at least 114 knots not much of an its reason but nough to allow the sathly to steam with the 18 knot touchana clear without reducing the speed of the whole fact to 17 knots I would replace the 8 kt at guas with four 19-lnch 4 caliber guas and add two 7 inch and four 3 knot guas to their present and two 7 knot at your days to the sate of the 18 knot guar to their present and two 7 knot guars to their present.

I nneth 375 feet to Beam 77 feet to shout Displacement 11000 tons to about 781/6 feet 14 500 tons Horse w r 10 100 to about Bjeed 17 knots to about 15 000 H P 184 knots Sunksr ana ity 170 t us to alout 2100 tons Rattery 4 12 in 1 4 10 in h 10 7 in t and 16 3 inch

The armer to remain the same as originally

This would he nather costly change but when armini is a edd the xpense is a small item and tiese two ships with the increased speed and heavy batteries would be a welcome addition to our first line of pre-dreadnoughts Chicago III

(Such hanges as ar suggested by our correspon-ent would be the costly for the benefits secured is would not be possible to install four 10 inch guasthe weights of gans turrets ets would be prohibitive.
The m ney would giv more fighting value if applied The m ney would giv more fighting value if applied to entirely new ships of the dreadnought class — Ep]

Beath of Frof Amos E Bellver Prof Dolbear ditd at Bedford Mass on February ird at the age of seventy four He was widely known as an inventor of electrical devices Perhaps his in as an inventor to electrical coveres Fernals on in veeligations in wheles elegarphy brought him more into public prominums othan any other but the result as an infringement suit in which be unsuccessfully sought to restrain Mart oni from continuing his experi ments

Prof Dolbear took the degree of BA at Weeleyan University in 1866 and the degrees of MA and ME University in 1866 and the degrees of M. A and M.B. at the University of Michigan in 1887. From 1886 to 1897 he was instructor in Chemistry at the University of Michigan. Then he occupied the thair of Assistant Professor of Natural History at the University of Kornton University of Story and Chemistry at 1884 to 1874 he was Professor of Physics and Chemistry at Berhamy. W. a Fron 1874 to the time of this death he was Proron is to the time standard was rivered for of Physics and Astronomy at Tufts College His attentific investigations included the sludy of light His stentific investigations included the sindy of light and electrical phenomena the properties of the ethic magnetic tolophony stati tolophony heavy corre-ammeters cables for telegraphi and telephoni work wireless telegraphy and be oropyrties of matter

(omet B 1910

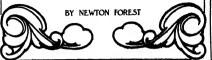
temes B1910

Prof Pidoux of Geneva Observatory Switzerland has cabled to Harvard Collage Observatory stating that be disavered a comet on Petranty 20th in k A 0 h is min 241 see and Der +7 deg 50 min and 41 see he daily model on tright sear notion was -22 min As exceeding the delivation -34 into the new conset is not very far from Halbuy comet A cording to the currected ophenevies of Crementin the positions of Halbuy comed At 0 h it min 25 see. c +7 deg "

According to Electrical Engineering a definite pro-posal has been put forward for the construction of a tunuel between Dennark and Sweders starting at Co-penhagen and consecting up with Malone Connec-tion would be made on the way with the small islands of Amager and Sathtolm and the electric trains which it is proposed to work through the tunuel would rus on the surface on these islands in order to reduce the underground (purary as much as possible. If the scheme is curried out it is cettimated that the traje could be made in 1½, howe



OSTRICH FARMING AS AN **INDUSTRY**





Does estrich farming pay? The question is asked by almost everyone who visits an estrich farm. The answer is that when an acre of alfalfa will furnish a for four birds with food enough to maintain lons for four birds with food enough to maintain them throughout the year when an outrich will yield annually about two pounds of feathers with an average value of 2d a pound and from hithy six to alterly eggs with may be used for Insubstion or may furnish food at the rate of seal for lone younds to the egg if the owner does not wish to Increase his troop outrich farming does pay and pays well.

There is nothing were juvable about an ostrich as there usually is about tober domesti azimats. But lowerer lacking in personal charm it may be the bix hill a non-yound producer. A level if may be the other than the part of the part of the pays of the pay

hird is a monty producer. A head of cattle eats sixty five pounds of alialat in a day an ceirful in no pounds. This head of cattle at five years old is worth \$10 and an ceirful at that age is wouth \$270. There is nothing to the cattle but meat. At ten months the ceirful will produce \$10 worth of feathers and therafter from \$28 to \$10 worth of feathers and manually for a long tended of seasons. you to sit were or restours annually to a long period of years. I hough an outrich is matured at the age of five and is reproducing its average life is about that of a human being. The bird does not be gin to decline until it is fifty years old. Many how

gm to decline until it is nry years out many how were produce fine i tumage at the age of a venty five There is as much difference in the breed of catriches as there is in any other animal Some of the Call formis and Arisons male birds are rated at as high as \$7 000 each but ordinarily the value averages ab \$400 for a one vear old 1 trd and about \$100 for a thick Some of the tooks weigh as much as foo pounds and stand over ten feet high

It has of late years been found that a great deal of It has of late years been found that a great deal of money can be made in outrich fearthing Especially so where affaifs or lucers as the raised on irrigated lands in the Sait River Valley in Arizons there are about 2 000 a ree of 11th land soon to be made riber and more, productive through immense that they made they made to the works on which the United States is spending too works on which the United States is spending too 000 50 km at climate is an feed one for outrich farming as the farms in that locality have airready proven by their successful operations. While the hirds theirs best in a warm dry climate they can be grown in any of the southern States and Territories of this country in a moist climate however they would have to be protected from cold and rain

It is only a little more than two decades ago since the first catri hes were brought into the United States ose of attempting their culti

here Before that time the only birds seek in this country had been adjuncts to divense. To-day at citative of those in soos there are stone four thosesaft hirds on the American continues. Probably half of the time to property of a single sair owned in the contract of the country of the coun

The female estrich matures much earlier than the cock beginning to lay fertile eggs when she is about three and a half years old. The next is nothing more or less than a hole scratched in the ground which is ne by the male bird At first the hen may not take to the nest but may lay her first eggs on the ground whereupon the male will roll them into the nest whereupon the male will redi them into the nest cleancily after the male has put three or four eggs into the nest the fermale will take to it. She will then lay an egg every other day until about sixtoss-eggs have appeared in the nest. An ceirch egg is nearly eight inches long and about six inches in di smeter II makes a good omselst and its arcellest when strainful Good one gew III make as much omselst as there doesn hem eggs A rull-grown bird has been known to produce over three hundred pounds of agg food in a year

food in a year. An annual increase of about fitty per cent of a food in severed mainly through the use of incubators, and the severed mainly through the use of incubators, and the severed mainly through the use of incubators, and the severed mainly through the severed mainly the An annual increase of about fifty per or oring the eggs at intervals during the night to prevent them from becoming childed. The birds are also very watchful in the warmest season to prevent the eggs from becoming superheated by the sun. The birds do this by resting on their ankle joints and spreading do this by resting on their ankle joints and spreading their wings umbrells wise over the nest As is assault; the case with all eggs in a dry climate the shell of an estrich egg becomes dry and hard. It is therefore very difficult for the chick to break through. When the time arrives for the liberation of the young they are board to chirp and to move in the shell, it played bird seems to badewined the situation, will often creds the shells with he breaddone, so will often creds the shells with he breaddone, so times taking the young by the bend and pulling it of the shell Sometimes from or five dryst edges tween the hatching of the first and the late egg. It into that the contract of the purely halds sitch in the a walls the other takes care of the chicks. However, a well registated out the farmer seation birds in hatching by executing the eggs with a ma humoner and putting the unlabeled eggs into at it.

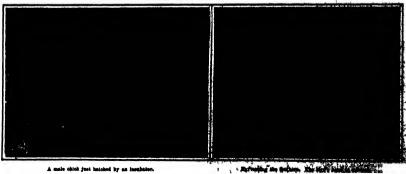
Dator

The chicks appear to be all ayes and necks when
they first come out of the shells yet their hodist are
as large as those of full-grown heat They are see
fussy and as soft as a day-old chicken but far more

fuscy and as soft as a day-old ohthen but far more steptif For the first week of their existance nothing but graval is given the young ostriches. Then thay are turned into small pean is the alinkin lots where they are to est slight for the rest of their lives. Picoling is the general term by which the harrest-ing of feathers is known. The term might lead one to believe that the feathers are pulled out. This is not the case however for that would injure the hind. not the case however for that would higher the hirt. The plumes are mipped off with shawr close to the Sash. The quills that are left soon die and drop out after which here whethere begin to sprout There are twenty five long white plumes on each wing of the cook blet The reat of the plumes is black on the male and of a grayish color on the femile. Gatherine the tacthers is no eary task. This work has to be signed with great care for a kick from one of the powerful less of the brief the snowigh to disable a man for life or even kill him contright.

or even kill him outright.
At the plucking time the birds are driven into indi-vidual plouking boxes and a loose bag slipped over their heads, which tends to keep them quist A cock bird will roar moorachily while being plucked al-though the operation is absolutely paties. After he has been stripped of his plussage he is about as mgty a sight as one could whold?

The first experiment of estrich farming in this country was made by an Englishman who imported his birds from Africa and paid as high as \$1 200 a pair for situa from Aricha and paid as high a \$1,000 a pair we them As it meanly every venture of this chargedor, the originator of the spheme did not make a fortune out of it. But the wise and daring havenow who hal-lowed in his footstops are new congretuinting them-solves. They are reaging the harvest his death dreamed of by the sparier of the injunery in that



A male chick just batched by an insubator

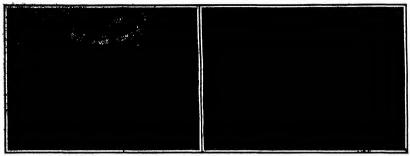
Scientific American

To fifteen, topiospies, by spilliners to most for spilliner by high-grade frankane, and it they were superative freely on the spiest limported from Arrise, it would be given out of the question. But no fouring far has 'the despresse orienth-framing industry tiple is, thing supply all the surpely in now home product the continuous productions and the spiest as the including response in the United Stages are just as the including response in the United Stages are just as the including response in the United Stages are just as the including response in the Stages of the Stages are just as the including response in the Stages of the Stages are just as

operation in done by French girls, and the skill with which this work is carried on is marvelous. To each fine on a long plume is tied another in such a way that the joint is invisible flome plumes treated in this manner have been privide at \$1000

Mektren Metals a New Light Weight Alley At the International Aeronautical Exposition in Frankfort a Grissheim firm sxhibited a new and

The field of usefulness of the new material, there fore, is very extensive its strength and lightness makes it especially valuable for the construction of at ships and seroplanes, but it may also be employed with advantage in the construction of automobies motors, and machines and instruments of every inid. It is no much strongers and lighter than aluminium and in all in alloys that 60 pounds of the example in a Foundition of the pounds of those materials. For example in a Foundition of the pounds of those materials. For example in a Foundition of the pounds of those materials. For example in a Foundition of the pounds of those materials.



As antidochors and

A pair of birds and their oggs

The beainess of ostrich farming has long become a network before it was introduced into this conting in feath Arthur has all manner of laws to probe the state of the state of

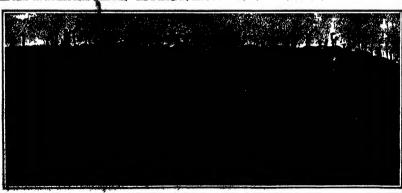
of the flower forces were grown to be a second to b

pound and the industry in this can part of the state of t

patential alley or series of alloys under the name selectron match. These alloys possess great strength united to exceedingly low specific gravity and bases appear to be the material of the future for various structural purposes. Alumiatum and its alloys the lightest metals are used in particular, are 8 type some heavier than elektron metal and far inferior to it in arrangth and tenantly. This new alloys are composed qualities of which metal have been very greatly the proved by additions of various other metals. The alloys vary in specific gravity from 175 to 30 possess great strength tenantly match the second provided as beautiful aid various other metals provided as beautiful aid various other metals provided to the second provided and th

airship having an aluminium frame weighing 1900 pounds 6000 pounds weight could be mared without any reduction of strength by the substitution of electron metal 11 would then be possible to carry more fuel and hallast increasing the radius of action more presented to the array and more powerful motors. It may even be found possible to disminish the dimensions creative components of the new material. Situation and the strength of the present of the new material situation of the could be replaced by 175 pounds of aluminium which could be replaced by 175 pounds of aluminium which could be replaced by 175 pounds of aluminium which could be replaced by 175 pounds of aluminium which could be replaced by 175 pounds of aluminium which could be replaced by 175 pounds of other metal. At the expectation the new material was shown both cast and wrought into a great variaty of forms—Unuse hau

The consumption of pulp wood during 1908 by 351 pulp mills in the United States amo inted according to a preliminary report of the Bureau of the Consus



The value of the 110 birds in this picture is at least \$50,000.

ORTHOGR PARKING AS AN IMPOUTRY

to the 15 600 pounds per square lack and an estemblitty up to 5 per cost. By pleasing rolling and drawing the installs strength one by foresand to yeary nearly 10 000 pounds per neater fact and the estemblitty to 12 per cut, without produced and the consultative to 12 per cut, without produced the per cut to 10 to 10 per cut, without produced the per cut to 10 per

to 3 246 106 cords of wood which furnished 2 118 947 tons of pulp. Nearly 136, million cords of domestic and over 670,000 cords of imported sprue were con sumed. Next in order is demestic hemick of which 69 137 cords were converted into pulp. More than 800 000 cords of poplar ways out last year mostly from domestic things. The remainder of the timber short 19 per cest, was chiefly supplied by pine cottonwood, and balanam.

THE HEAVENS IN MARCH



S the year advances, there is of cometary phenom ena which make the first half of 1910 so not worthy inness s court which was so inness a court which was so fine so edded at the end of Limitey, come almost to red among the stars early in Phrinty moving alm

straight away from the curti and rapidly losing bright ness. By this time it is unobservable, behind the sun and some distance nurse in the celliptic. In another mounts or so it should be seen in the morning sky, but

only with telescopic aid

The determination of its orbit has apparently presented nuusual difficulties, in order to calculate a comet's orbit, we must first have accurate observations in order to calculate a Such observations are usually made by of its position. Such absorvations are usually made by measuring with the telescape the distance and direction of the conset (or equivalent quantilles) from some size whose data the has by a known from protons observations taking care to note the time at which these measures were made. In the present case the count was at first chibits only in daylight, when no suitable. Your

parison stars' could be seen its position in the sky had therefore to be found by means of the endings of the graduated circles attached to the tele scope, and these are far inferior in accuracy to measures of the former

Il is not therefore sur prising that the prolimi mary orbits calculated from these rough observathemselves When the morping sky, and can be accurately observed, the comparison of the results with the few accurate observations made in ianu ary and February will set the the question

Halloys comet is also out of sight for the pres -behind the sun nearly so and about 176 million miles away may still be observed telo ically low in the west in the early evening for a few days early in the month, but it cannot be seen in the morning sky until April is well begun, when it will reappear, ably for brighter n it vanished in the twillght

We must therefore for the time being hern our attention mainly to the stars, and among them we will find much to occupy us while we wait for the

Let us begin right overhead with the constellation Gemini its two principal stars Cas-tor and Poliux, identify it at once, for nowhere in our skies are two equally bright stars as near neighbors The roughly parallel lines of stars which run south west from these and terminate in the stars \u03c3 and \u03c3 castor itself is a fine object with even a small tele-

scope, showing double with a power of fifty diame The two components, one about twice as bright as the other revolve about one another with a period of perhaps 400 years. The faint star which lies about twolve times as far from them as they are from one another is moving with them among the other stars, and is is mustice with them among the other stars, and is unrobably alse in very slow revolution about them but, if so must link more than ten thousand years to complete on landy clear! This star 2 is also a fine double Close by to the centward in Cancer, with no bright stars but one luter-suitsy cluster, within clearly to the maked ove, and resolved into its separate stars. This spot of links known as Traceopp by a field glass. This spot of links known as Traceopp (the Bechive), is marked on the map Auriga, which ites in the Milky Way, northwest of

the zenlih, is one of the finest consicilations in the sky The figure of the charloteer knewling in his charlot forms our initial letter The most northerly

bright star of the constellation, δ, is in his head, β is in his right arm, and the brilliant yellow star ('aprella (a) marks the Gost which he is supposed to hold in his left arm, while the three smaller stars just below it are called the kids—an armful indeed.' just below it are called the kids—an armful indeed: Farther south \(\theta\) is in his right knee, and \(\text{c}\) in his left foot, uncomfortably near the tip of one of the ltulis horns (\(\theta\) Tauril

Canella is next to Siring the brightest star in the part of the skies which we can see-secording to the data of the Nautical Almanac Arcturus and Vega are however very nearly its equal in hrightness, and the three stars differ so widely in order that different ob servers, whose eyes were unequally sensitive to light of different colors, might easily disagree as to their relative rank Well down in the west are Orion and his neighbors, Canis Major on the left and Taurus on his neighbors, Canis Major on the left and Taurus on the right Mare passes through the latter consisies tion during the month, and fairly rivals Aldebaran in color and hrightness Persous and Andromoda are in the northwest—the latter partly set—and Cassiopela farther to the left

Farther to the left.

Due south we see Procyon, with the few faint ablendants which are supposed to resemble the Little
Dog, light up near the meridian, and part of the great
constellation Argo low on the horizon Farthor east,

right of the pole, Ursa Minor, inclease within the aweep; and Cophens, low in the north, complete our

Mercury is morning side gill through March, but, being south of the sun, is not well observable in those latitudes. He may perhaps be seen early in the month, but only with difficulty, as he rises but three-quarters of an hour before the sun.

Venus is likewise a morning star, and, unlike Mer

cury, is very const

cury, is very conspissions.

Ble reaches her greatest brightness on the 18th. At this time she appears, with a magnifying power of fity diameters, just as the crescent mone some five days old does to the naked eye, except that her arrive is free from perceptible markings, and naifornily white. Ble riese about 4 A M and is the principal ornament of the morning sky indeed, there is no difficulty about seeing her in broad daylight—if the sky is raily clear—except that of knowing where to keep a state of the sky is raily clear—except that of knowing where to cent mone will be a good guide, as Venus will lie shoult she or six degrees pearer the sun, and shows about five or six degrees nearer the sun, and about two degrees above the line joining them

Mars is still an evening star, but is steadily losins

to 170 million miles during the month, and he moves eastward among the stars through Tax keeping well ahead of the snn, so that he remains in

sight till after 11 P M Jupiter is in opposition on the 31st, and is visible all night long lie is a splendld object to the naked eye, and a fascinat lns one in even the small est telescope His four large satellites can be seen without difficulty, unless indeed some of them should be behind or in front of the planet. In the latter case their shad ows can be seen, as black dots on Jupiter's surface, with more powerful in-struments, and afford one colestial exectacion as they

transit across his disk
The elliptical form of the planet due to his rapid ro-tation, and the dark belts which cross his disk, par-allel to his equator, can also be seen with a small also be seen with a small instrument The four other satellites, discov-ered in recent years, are observable only with a few of the largest tele-

Saturn is an evening star, setting about 8 P M in the middle of the month Uranus is in Sa gittarius, rlsing about 3 30 A. M. at the same date Neptuns is well observable in Gemini. his position on the 15th being R. A. 7 h 11 m 35 s., Dec

R. A. 7 h 11 m 35 s., Dec dieg, 44 min north, and his apparent motion very slow To identify him, how-over, one needs either a detailed star map or a tele-scope large enough to show his disk, that is, six inches or so in aperture The moon is in her last quarter at 3 A. M on the

The moon is in her last quarter at 3 A. M on the this, he new at 7 A. M on the 11th, in her first quarter at 10 P M on the 17th, and is full at 3 P. M. on the 25th She is nearest usign the 13th, and farthest of on the 28th. In her circuit around the sky she passes near Uranus on the 7th, Venus on the 8th, Mercury on the 9th Saturn on the 18th, Mars on the 18th, Neptuns on the 19th, and Jupiter early on the moraing of the 26th—only the last conjunction being at all

At 7 A M. on March Stat the sun or At 7 A M. on march sist the sun or crosses the or till equator, passing over the point in the heav called the vermal equinor, or "first point of Ar's and in almanac language "Spring commences." Princeton University Observatory



NIGHT SKY: FEBRUARY AND MARCH

on a level with Protyon, a small but cons marks the head of the great serpent Hydra, whose body may be followed, past the lonely red star Al phard, down to the southeastern horizon. To the left are Corvus and Crater, and then Virgo made un usually brilliant by the presence of Jupiter, which is just below the notable double star ? Higher up is Lee, one of the finer constellations, recognized at once by the 'Sickie,' at the end of whose handle is the first-magnitude star Regulus.

nucleagation at Regulus.

Farther west, near the horison, Arcturus shines
brilliantly, far surpassing his neighbors in Boötes.

Above and on the left is the familiar and gigantic
form of the Great Bear Within the curre of the
Bear's tail (the Dipper handle) are the Hunting Dogs

which the contract here of the contract of the contrac which pursue her on an endless chase around the pole. They have but a single bright star, but this is a fine double, worth looking at if one has a telesc

agnifying twenty times or more.

The group of small stars known as Berenice's Hair, The group of small stars known as Beenines Ravard, is a good example of a star cluster so coarse that it can be resolved by the naked eye but yet composed of stars falls enough, and naker enough together, to produce almost the impression of a nebula at a hasty glance, while doppy servitary above the individual components. Drace, costning up on the

Gliding Glass or Percelain.—Prepare a mirrays of 500 parts of layender cil., 160 parts of gold chloride. For parts of layender cil., 160 parts of gold chloride, for parts of blassing to subpirate, and 56 parts of chrosses soap. After application, have the main be dry and bake the article has repulle flowing. In Francisco. A information of the layender of the control of the chrosses of the control of the chrosses.

BULLET'S FLIGHT THF

SOME NEWLY DISCOVERED ERRORS IN TARGET SHOOTING

In the face of many excuses, it is a recognized fact that the built from a rife seldom strikes the target where the marksman would like to have it strike The constant endeavor for years, in all countries, h

been to perfect e its errors at the target. Unmoney have been expended in these forts. According to the author of the book which the book which an author who speaks with a conviction gained from years of DE tient investiga-tion the innumer able causes of in accurate rife ting, many of shooting, many or which have been known for a long time, may be di-vided into two great classes

Seet those inhe-

lines and screens enabled the author to follow the course of each bullet, and the acreens were spaced at distances along the range to match the experiment in hand A distance of three feet spart was sufficient for the bullet's motion Day by day facts were accumu-17/1/2

Section 1988

Fig. 1. -On concentric notion. Fig. 8.—How the center of gravity of an unbalanced built and at the muszic, it takes a straight flight as represented by the tangent of

rent in the rifle and its ammunition, and secondly, those which are external to it.

His experimenting and hence his discussion deals exclusively with the errors adherent to the rifle and

A Comment

anituatively with the errors adherent for the rife and ammunition, and does not consider any of those be-longing to the second class, such as air currents, per-sonal elements of the shooter, bundfuly of the air, or any error in siming the rife. Years of carvid ma-thin-rest shooting and the experience of thoughtful riffenen point clearly to the fact that, whom all the clements of the second class are excluded, the rife and its ammunition produce a regular and everprea ent error at the target which has not yet been over To determine the nature of that error is the

come in decrining two accessed in the create in the suther's primary purpose.

The cause of this ever spreading of shots he has experimentally disclosed, with the result that the rifleman knows better than he ever did before, the defect of rifle and hullets. The book teaches us how to eliminate the errors of the rifle and its ammunition, and w which elements of the cause for such errors cannot be overcome by human skill, thus allowing us to proceed intelligently rather than under old meth of guesswork experiments.

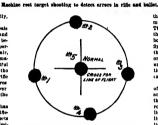
ods of guesswork experiments.
The method and apparatus to bring out these hither
to undiscovered errors are fully set forth, illustrated,
and explained. The system of investigation adopt
was beased on the principle of excitation, that is, the was oased on the principle of excusion, that is, the personal element, movement of the air, mirage, and faully aiming were eliminated. Covering as it does the work of years, the book is commendably ex baustive

During 1901 a suitable machine resi, differing ma During 1901 a suitable machine rest, differing ma-terially from anything before produced, was made as bere illustrated (Fig 1). It was built of concrete, and was permanently right (Jone) it a broase? Of there heat long was securely belond. The barrie of the right, monthed in alimnitum right, one for the musted one at breach, and, thus currounded, was held in its hormal position in the house. Y which was accurately machined. A concentric action, as shown by illustra-tion (Fig. 3), look the place of the normal right con-trolling this part of the outst. The line of fire remained the same from they to day and from you-

Between the rifle's mussle and target, paper screens

Between the rine's mussic and were placed, through which the bullet passed in its flight. A perpendicular line through the center of each screen, by the sid of telescope and cross hairs, was of telescope and cross hairs, was hrought into exact line of the V rest, which was also the line of fire of the rifle barrel which lay upon it. This arrangement of

⁶ The Bullet's Pright from Fereder to Tri-ight. The instruct and external bullsten or qualit green. A entry or risk schooling with the puriousl element confident, disclosing the cases of the error at the term. Ill manuscul-cities this plains showing the results of over-gibit this superiously justices and strans-inglicity parameter. Jay 7, W. Mann. R.S...



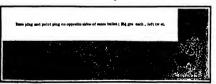
Only one builet hit the mark (center) although all were fired un-exactly the name conditions. The picture shows the X error

Fig. 4 -Five bullets fired from a fixed rest.



This took the piage of the normal rife action, the lass of fire remaining the same year in and year out.

Fig. 5.—Riements of the o shows in Fig 2.



Task the extens of upper inft sorror where a true bullet points to numbers I and I bullet holes is 614 inches and is 160 yeards. The errors investe as distances from the manule show that No. 3 shot had no Z way. A like we have absent that so to Ea. 1 bad no Z acros. This liberartion shows the error resulting from a tipping

Fig. 6.-Y-error of 190 yes "Learneed by actual target made by two unbelanced builden.
225 Markov Plants - 6863 MEN'S BROWNERD REBORS IN VARIET SECONDS.

testing some of the curves which the build made, but in many experiments it was found necessary to place the screens from six to three inches apart to register

> and of several years the author could so place any desired infor mation respect ing the bullet's motions could be expeditionally ob-tained, one irregularity after another being eliminated to that end

As is often case in all scien preconcaived ideas of the bul lot's action proved to be more or less incorrect. and he stronges fixed idea of all.

the one to which it seemed all conclusions must be made to bend, was found to be absolutely incorror. This idea, that the butlet during its passage through This idea, that the builet during its passage through the rife must and did fly in a straight line with the bor, and that afterward it changed list effection to fly away from the mark, held the author back from the real fact for years. Streems placed at one two, or three foet from the muzile showed indisputably that an unbalanced builet left the line of fire, or line of the bore, immediately upon its exit therefrom, and the cause of this was a very astounding discovery to make

tause of this was a very astouding discovery to make it is easily understood that the center of gravity of an unbalanced builet is not in its center of form, and therefore not in center of the riflo bore. Due to the twist in all undern rifles, this unbalanced builet rotates during its passage to the musrle and carries its center of gravity in a spiral around the straight line forming the center of the bore, and also carries into forming the center of the bore, and also carries its center of gravity around the center of form of the builted itself in mechanics and especially in ballis-tics the course through which a hody moves is the tion the course through which a nody moves is the lime in which like center of gravity travels Hence the unbalanced buildt fall bullets being more or less un balanced) travels in a spiral through the straight rified lower, compelled to take this spiral course, by the solid walls formed by the internal surface of the barrel

When the projectile is liberated at the muzzle, no inger forced to make a spiral flight, it immediately takes up a straight flight, which it must do according takes up a straight sight, which it must do according to the fixed laws of inertia. This straight line, however is a conlinuation of the flight which the bullet was insaking as it left the muzzle not the line of bors, but a tangent to the aptral which the projectife dearthed in the bore as represented though groundy as agreemed, by the spiral was and its tangent to or r in

Fig 3 evaggerates and makes clear how the center Fig. 3 evagperates and makes clear how the center of gravity of an unbalanced bulle move in a spiral form within the bore, but how who illbrated at the mustic, it takes a straight illight, as represented by the tangent at the right extremity of the spiral in the direction of a No possible power at the muss' could make it take the direction of bore as represented by add, without distinctpraints the bailet, based of flying straight in the rifle force as every one supposed, and making some, change in the direction afterward, in resulty files in a spiral during its parallel for the contraction of the contraction of the spiral during its page to the muzic, and does not sage to the muzic, and does not

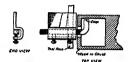
y nies in a spiral during its just-sage to the muzele, and does not change its direction at the muzele, because there is nothing there so to change it. This is the long-searched for cause of error at the target

The presence of this error, called the "Y error" by the aucalled the "T error" by the au-thor, was clearly demonstrated in screen shooting by E A Leopoid of Norristown, Pa a number of years ago, and the apparent change of direction in the flight of a buildet at the muxit was known in an indefinite manner to various rifement. Their altempts to overcome it, and the theory upon which these altempts was (Continued on page 216.)

TOOL-HOLDING DEVICE FOR WOOD TURNING

BL I HALBORY W NIPHAR

House who me a wood lathe find frequent occasion to make special tools for difficult or unusual work, and when the tool is so shaped that the cutting edge is at right angles to the shank, great annoyance is apportenced in holding the tool to the work, and keeping it from turning in the hand Recently I had



TOOL-HOLDING DEVICE FOR WOOD TURNING

a piece of work similar to that shown in the drawing and after many expedients had falled to give complete ratisfaction i developed the device illustrated. It is reade of heavy sheet stori (the heaviest i could work easily) and provided with two saturcess, as shown, to siles it to be moved along the chiesi as desired, and for the insertion of new chisels. As illustrated, the flat portion lies on the tool rest, and this abs lutely prevents the turning of the tool lutely prevents the turning of the tool. By its use I was able to reach with ease the most inaccessible

ELECTRIC INCURATORS AND BROODERS.

The nilvantages of an electrically heated incubator over these making use of kerosame lamps and the like are so great, that as rupidly as cheap reliable power service becomes extended throughout the country, the liatching of ogen by obstrictly bids fair to displace all

An electric incubator can be built at home by any-

An electric incubator can be built at home by any-body who cast make a wooden box and connect up the cast make a wooden box and connect up and the cast make a wooden box and connect up the cast make a wooden box and continued to having nothing about the law on, and or being couplies of giving perfort creating one, and or being capable of giving perfort creating who will be the photographic about the present The photographs above the first incubator built to the author, while the drawings give details of con-struction drawn to excle, for a similar machine of fifty exex capacity. Directly it consists of an outer and an inner wooden box, having the space between them pasked with wood or other heat relaining ma-terial The eggs are placed in the inner box, which is waited with incandescent lamps controlled by a iterriticati

The loxes should be made of well-seasoned lumber about 's inch thick. Old soap boxes furnish good material for the

For a purpose rolling the luner box needs to be it inches wide, 17 inches long, and 11 Inches deep, all inside meas crements. This box is to be left without any or bottom (keept a statted bottor which is to be put in half way down

thus dividing the lox into an upper and a lower compartment of equal depth. On top of the slats a double thickness of woolen blanket should be tacked, to support the eggs, as shown in Fig 1

Eight cleatric lamps are required for the heating units. These are best mounted in porcelain recep-tacles as shown, four lamps in each compartment near its ion For 110-voli circuits use ordinary 16-can die-power earbon filatuent lamps made for 230 volts. and connect them as shown in the diagram, where REG means regulator, or thermostat and RE are snap switches to be placed on the outside, as shown in one

Scientific American

It is hardly worth while to make a thermostat at bome when one suitable for the purpose can be benefit. From a dealer in electrical supplies for about service, from a class in electrical supplies for about service, the control of the service of the service of the service. It is taken pleasure in defing such word: Fig. 2 shows a lastice of the seg chamber. The essential part consists inside of the seg chamber. The essential part consists of two strips or metal riveted together as shown in the top view at A. Zinc and stor! (or iron) makes the onest effective combination, brans and steel (or iron) come next. The strips should be about 1/33 insh like, A linehs tong, 1 inch wide at the large sed come next. The strips should be about 1/32 inch shick, it inches long, I inch wide at the large and and 2/3 inch at the narrow end Thou may be fast and 2/3 inch at the narrow end Thou may be fast by siderint the large and and 2/3 inch at the narrow end Thou may be fast by siderint the large and the large. The two instals thus joined tend to curl and uncurl with changes in longerature, by reason of their different rates of expansion. The large and should be clamped to a brinck, B. as abown, and a counted from the outside to reverte for adjustment from the outside to reverte for adjustment from the outside the spot on the nine for the shorting are which appears between them will soon destroy them the spot of the shorting the

top by three or four half inch tubes for ventilation as shown at V, Fig 2 The top of the egg chamber is best covered over

with a pane of glass, on top of which is laid a small pillow or several thicknesses of folded blanket. Next in importance to the thermostat comes the choice of a thermometer and its proper location in

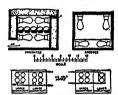


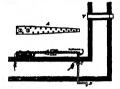
Fig 1.—CONSTRUCTIONAL DETAILS AND WIRING DIAGRAM OF THE INCURATOR AND BROODER.

the egg chamber, where the bulh should occupy a central position rather than one near a corner it is not necessary to buy an expensive instrument in order to get accuracy, an ordinary teneent thermometer can be made to serve the purpose very well provided that its scale be properly corrected or 'calibrated' This and scale so properly corrected or 'calibrated' This may be easily accomplished by taking advantage of the fact that the internal temperature of a normal, the takethy person is just a trifle over 98 deg Tie, a thread around the tube at the place marked 95 deg on the scale, and remove the tube from the scale, but the scale, and remove the tube from the scale.

eight lamps in use, the apparatus as described is capable of maininining a temperature of 164 deg. in the egg champer when the room temperature is only 40 deg. If used in a warmer room, one pair of the lamps in the lower compartment may be turned of

Marin & 1919

by means of the amp switch
Each pair of \$20-volt 15-candle-power on Ench pair of \$50-roit 15-canda-power carbon hamps, connected in series as shown, will, when used on a 155-roit circuit, burn with a dull red glow searcely registle in daylight, and with a power consumption of 54, in daylight, and with a power consumption of 54, the temperature is \$4 day, common an occupation of the temperature is \$4 day, common an occupation of making a total for 35 days of about \$1 kinevant hours, which, where the rate is 10 cents, costs 50 cents. This cost isots high at first sight, but it is materially lower than that of a horesen-burning machine if one stops than that of a horesen-burning machine if one stops are acting in the contraction of the investment,



Pig 1.-METHOD OF APPLYING THE THREWOUTAY.

the saving in oil, the absence of depreciation and pair hills, and the saving in labor of atte In the practical operation of the incubator, the fol-lowing points should be borne in mind

The eggs need to be turned partly over every day A cod way to do this is to take out the row of five eggs

good way to do this is to take out the row of five eggs at the left hand, and, roll the remaining ones toward the left, and replace the five at the right-hand end. This progressive movement serves also to even the different times of hatching that might result from come eggs remaining in warmer good than other face once eggs remaining in warmer good than other face remaining ventilation is required an incubation progresses. Practically no air is needed the first progresses Practically no air is needed the first over vents, and all ventilating tubes and the door to the lower compartment may be kept closed with considerable economy in power. During the third week, and competally when the hatch is due, plenty of air must be allowed to filter up through the eggs, as shown by the arrows in Fig. 1.

to allowed to filter up through the eggs, as shown by the arrows in Fig 1 No moisture is required during the first week Therester it is best to keep a small pan of water in the lower compariment and a small glassful in the ogg chamber These serve to prevent eggessive evap-

cration of the eggs by too dry air
The newly hatched chicks should not be taken out
or fed until they are 24 hours old After this they may be kept in the lower compartment for a time, provided all four lamps be kept burning. As soon as conveniont, however, they should be transferred to an electric brooder, two forms of which will now be de-

scribed
The first and simpler form, suitable for use only in
a well warmed room, is shown in one of the phone
araphs. It consists of a small wooden table carging
on its under sides four lamps, and surrounded by a
fringe made by slitting a piece of db hanket. Per
use on the ground or where the foor is not warm, bottom best must be provided as shown in Fig. 17 when
chicks can be secon mond a sed.

commodated by such a brooder baving the follow-ing dimensions Top, 14 by \$6 inches, supported by legs 8 inches long. Bottom box of wood, 16 by 20 inches outside, 3 inches deep inside. Box-cover of tin 14 by 20 inches, protected on top by a sheet of

sprinkling of mad Four lamps are required in the upper part, one near such corner, and two in the bottom heater it will be observed in the diagram of connections that the latter lamps are connected in parallel and not in sortes which compete connected in parallel and not in series, which them to hurn more brightly. The pewer commu-is 33 watts, or about twice what is required for ing. No thermostatior thermometer is needed; if brooder. It will not get too warm if the cur-

brooms at win new me too waters as you make it in the first on all the times.

Where any form of brooms brooms with a like described, in spent it to become you will the described on the weekly the first of the first of weekly.



COMPARTMENT OPEN.

the hulh under the tongue at the side of the m and hold it util the mercury column does not rise any higher By observing with a mirror it will then be possible to determine quite accurately, how minch in error the marking on the scale may be, and due allowance for this can then be made by meaning that

allowance for this can then be made by sussuining that the same error in present at the foldes, mark, which is the temperature of incubation.

The machine must be run a few days before any rass are not in, to give time for caryfully adjusting the thormoutst When the latter is once not right it will be the control of the

Scientific American

it the chicks may get up on the raised platform. following bill gives a list of all materials need-

and their present retail prices.	
For the Incubator	
\$ 230-volt 16-candle-power carbon lamps	\$1,60
8 percelain receptacles	.48
1 thermostat	75
1 thermometer	.10
2 single-pole snap switches	.80
1 piece 13 x 18 window glass	.20
Lumber, etc	.18
Total	\$8.58
For the Brooder.	
6 230-volt 16-candle-power carbon lamps	\$1.30
6 porcelain receptacles	
1 sheet 14 x 30 tin	.15
Lumber, etc	95
Total	

The foregoing bill does not include the shaded lawn and fixtures shown on the outside of the incubator in Figs. 1 and 3 An ordinary 4-candle-power lamp so is a convenience, but not in any way ease

CONVENIENT DOOR MOLDER.

A convenient door holder may be made from a barrel hoop, as shown in the accompanying illustra-tions, by cutting a piece about oight inches long and inserting a rubber-head tack (such as used in the inserting a rubber-head tack (such as used in the plumbing trade in such and, on the under side, as abown in Fig. 3. Two such tacks are also placed on paper face, speed apart antificiently to allow the bottom of the door to fit between them. The arched shape of the hoop will give sufficient friction between the door and floor to hold the door in any desired position. If rubber-head tacks are not available the node may be covered with some soft material such as carpet and tacked thereto. In place of tacks, a notch may be cut in the barral hoop squal to the thickness of the floor, as abown in Fig. 4 or the Illustration. The



center of a barrel stave may be used instead of a hoop by cutting it to about the same width as the hoop

BORING MOLES IN GLASS. Man 1 Mg

Giam is universally conceded to be exceedingly diffi

Giass is universally conceded to be corcedizely diffi-cult to work when cold, yet its fragile nature often calls for means of repair. It is also desirable contents to drill ingre holes in giass plate, or through a large plate of the content of the content of the content of any facilities hitherto developed for such work. It is well known that turpenties applied to a small drill will enable one to drill through a piece of giass by paradests application and frequent grindings of the drill. This hole will often taper from a larger dismeter at he top to a small or one of the bottom, the drill. This hole will often taper from a larger diameter at the top to a smaller one at the bottom, and busides it is quite impossible to drill rave bottom, and busides it is quite impossible to drill restrained work of certain classes would be made bottom also if it were of certain classes would be made bottom also if it were of certain classes would be made bottom also if it were or other parts are composed. In the opinion of the written be set fluid to be applied to the glasse so that the tool will take hold is that of the formular given below. It has been developed after many superiments with different mixtures, and will 10 found to be su perfor to anything beweighted from your with a betavel fit, we will hill, a place of plain glass many be not into fax used. But where there is much glass to remove, the congret the fit the bestor.

For ignificantly much joine, a bream tube of the classified of the about visible is breather than a drill. The hole glassified is called more of it the with that is do come in quinter with the flower of the classified of the about the flow of the classified of the best visible is breather than a drill. The hole glassified is the flower of the wind that is do come in quinter with the flower of the control of th

made in the side of the tube by filing into it with a round file, and it may be turned either by a drill press or by one of the small, geared, hand drall-stocks used for small drills. With a small break disped into the solution as herein given wipe the hole s and onto the mixture with run down inside the tube, and onto the glass where the hole is being made, and the tube will be found to enter the glass with sur-

rising ease.

If it is desired to have the edge of the hole sharp
here the tube comes through, cement a small plece of

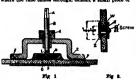


Fig. 1 -- APPARATUS FOR BORISO LARGE HOLES IN GLAM. Fig 8 -METEOD OF REPAIRING GRACEED PLATE GLAM.

giass to the under side of the plate being bored, and when the tube is through, continue the boring until it has entered the lower plate slightly Glass cut with the diamond will often break unevenly, and fall to fit a window sash, circles cut out for the dists of instru-ments of the clock class, circles for static electric maments of the clock class, circles for static electric mis-chines, giaser overse for galvanouters, ammedyn, and many other instruments are offen thrown away, when a touch with a file wet with this solution would save them. It is especially recommended to glasters to re-move the sharp odges of the giase cut with the dia-mond, which often cut the hands. For boring large holes in plate fixes the fig shows in the sectional view,

holes in plato grass the lig show Fig 1, is very handy, in fact aimost essential if correct re-sults are required. It can be easily modified to hold the cutter for boring circular work, ter for boring circular work, such as glass columns or con-cave surfaces, where circum-stances require such variation. The frame is an iron casting having feet J. and is bored out to receive a steel hushing C, which may be hardoned after a central hole is made to receive the shank B of the outreceive the shank R of the cut-ter bar The top of the cutter bar or shaft is squared at A so that a hit stock may hold it, or it may be held by the chuck of it may be held by the chuck of a drill press. The bottom has a flange and a pilot L, which fits in the hole of a small cemery wheel G of the kind used by toolmakers on univer-sal grinding machines for lapping out smell holes.

The lead bushing in the wheel

should be cut out on the side that is to do the boring, and the pilot L must not go entirely through the wheel, but be

pilot L must not go entirely through the wheel, but be out at least K, of an inch short of the wheel thickness. The wheel may now be comented to the cutter shift it be setting it, and sho the wheel slightly, so as to melt seems gut m shellar. which has been syrinked out low low the state of the shift of the shift of the shift of the old liquid gious and enery of about the same grade as the wheel, and fill the bottom of the look P www with the wheel In diright will shirt all sightly and the patter may be applied again, and until the surface is flush with the side of the wheel.

feet J of the frame have thin rubber F (k)

The rest J of the frame have this rather F (known in the strons as "rather dam") connected to their under after with bievels lire censons, so that when placed on the giass the jig will not allo around, but can be easily hold in any desired location. The place where the boils is to be made having been saccetained, a ring of puty D is stack to the glass to form a cup, and after the wheel shaft is insected to the bushing, the apparatus is placed with the face of the wheel over the spot to be bored, with the face of resting on the glass. Before beginning operations a place of double-thick window (also if is considered with French copal variath to the under side of the plate to be bored.

The formula for the finld to be applied to the tools

as follows Pulverised camp dr vi

Sulphuric other dr vi

Supplying of turpentine to make a six-ounce bottle full
Apply the bit stock to the shank A of the shart, then
pear enterph of the finid into the putty oup to cover
the forms after of the wheal G. Sulphuric ether

When the wheel is turned it will immediately enter When the wheel is turned it will immediately enter the gians, boring a vory smooth and tree hole if a drill press is used, the speed should be alow to avoid turnwing the field out of the cup or heating the wheel, the last being especialty avoided, as all of the constituents of the field are very volatile, and it will evaporate quickly if much best is present. When the bolt is marry through moderate the pressure, but keep on drilling until the wheel has entered the plants of slightly. A slight tax with a harmer will also the plant of slightly. A slight tax with a harmer will also the plant of slightly. A slight tax with a harmer will also the plant of slightly. A slight tax with a harmer will also the plant of the plant of slightly. A slight tax with a harmer will be plant of the plant of

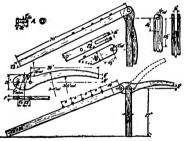
Fig 2 shows how a cracked plate-glass window may be repaired. At the ends of each crack and where they intersect a hole is bored to receive a boit. The nnt Z of the boit is made thin, and a rubber washer, made of engine packing is held against the glass by a washer and a rew The dimensions given are those used some time ago in repairing a store window. The heads of the screws were located inside the stor as to make it impossible to remove them from the out alde. The window is still doing service

A WAGON JACK.

MY L O. BATLEY

For oiling wagon wheels, or taking them off, some kind of lifting arrangement is resorted to For sim-plicity of construction and effectiveness the jack herewith described is unique. The whole, including the pegs or pins A, is mude of oak, the best tough white

pegs or pins A, is made of oak, the boat tough white oak being recommended. The beam is made from 3 by 4 inch timber, planed down to the dimensions given. An eye or slot is cut-out at the wide end 1 1/10 in hes wide by 4½ inches deep This end is rounded off to a radius of 2 inches. deep This end is rounded off to a radius of 2 inches. Five pegs, 1 inch diameter by 2 inches in length, are driven into the uper side. The holes are 1 inch deep and should allow the pegs to have a driving fit. The upright is 27 inches high to the center of the



A WASON JACK.

fulcrum, made from 3- by 1-inch stuff. The end is rounded off to a radius of 1½, inches, and a slotted hole is cut in, as indicated in the detail view.

hole is cut in, as indicated in the detail view. The lover is cut from 1 inch beard, 8 ins hos wide by about 33 or 14 ins hos in length 11 should be indicated accurately to the diamentance given in the learner scale view. When correctly made and the sid in the unright cut threads the two sholes for the peps 4 unique. The peps 1 course, as shown in the upper general view. The pages 4 should have a closes fit, and be trainfield with which we have the contraction of the course parts are assembled

parts are assembled. To operate the fact the lever is raised, as shown in dotted lines in the lower general skelth and the beam slipped in place under the sain of the wagon, which should rest between one of the small pegs in the upper face. Bearing on the lever it is pre-seed down into its lowest position, as shown in the upper acceptance, the should be securing it in that position indefinitely, without the least chance of its slipping back?

Swelling ground cannot be held by timber, means must be provided for relieving the pressure of the ground from time to time. It will cause little tro ground from time to time. It will cause inter crossing if spaces are left between the lagging, through which the pressure may be eased at intervals by removing some of the material. Expedients such as parking with straw are valuable only until the aveiling becomes sufficient to pack tightly the cushioniar substance. When this becomes packed solidly it transmits stance. When this becomes the pressure to the timbers

REGRETLY PATEETED INVESTIGES.

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menty antameted.
AUTOMATIC BRUILATINI REVICE FOR
WITHE TANKS. — W L. BRURAREM. Harrisburg. Fo. The device is particularly applicable
for kerping filled the lanks or troughs disposed in the occine of a railway rack for the
purpose of supplying vater to a passing or
site. The derice is actuated by a float in
which libe vater mechanism is operated directly
by the water pressure from the water main

Prime Mevars and Their Accessories, 1907/RNON.- J. P. Nivoove Tenaville, Ind. Particularly sateri, this invention relates to improving the valve mechanism forming a part of the invition and also improving the form of the wights operated by centrifugal force, and also improving the form of parts associated with these weights and with the raive can recludate by the governor

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MUNN & CO., 361 Breadway, New York Branch Office, 525 F St., Washington, B. C.

INDEX OF INVENTIONS

United States were issued for the Week Ending

February 22, 1910, AND EACH BEARING THAT DATE [Res note at end of list about copies of these patents.]





Engine and Foot Lathes MACHINE SMOP QUTVITS, TOOLS AND SUPPLIES. SEST METERIALS SEST WORKMANSHIP CATALOGUE FREE STUMLATHE OD 120 CHINH St., CLINIAM

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THE PERSONAL PROPERTY.

(Continued from page 198.) heretofore, several of its small steel is, but the construction novelty of the ras a buil built of phon show was a hull built of phosphor-bronse plates riveted together and attached to the ribs by means of U-shaped clamps passing over the latter and riveted to the hull. free boats were constructed by the Davit & Do Groot Company, a firm which has had a great deal of experience building riveted steel-hull lifeboats for the United States government. The phosphor-bronne hull has a great advantage proor-rouse BUIL DAM & greek SAVENINGS over the steel shill on account of the non-correstre qualities, and in addition to correstre qualities, and in addition to receive through the rith. In B. 38-foot, and the same state of the same cancern, the was the same cancern, there was installed a new type of hydraulies steering grear, which consists of two served cylinders with movable plungers placed at the tearing wheel and consected by means of small copper justings for The cylinders and tubing as a fined for The cylinders and tubing as a fined for The cylinders and tubing as a fined with the same state of the transmitting pitches at the steering wheel being sufficient to actuate the rudder positively. The mitters used is non freezing, so that cold weather does not affect it. This steering gave a decided inover the steel hull on account of its non steering gear appears to be a decided im provement over the usual form, since it is

easily worked and is more or leas selflocking. Probably the most popular craft schliized were the open speed beats, which
start with the selfstart was a selfstart with the selfstart was a self
start was a self

rule
The exhibit of engines this year was
a large one While many manufacturers
still stick to the 3-cycle motor, this is
used chiefly on low powered, slow-speed
boats having one or two-cylinder motors.
The speed craft aimost invariably are slitted with 4 or 5-cylinder motors of the 4
cycle type. 4 100 horses Miles. The speed craft aiment invarianty are nitted with 4 or e-prinder motors of the 4
cycle type A 100 horse-power Active
to the 4 cycle type A 100 horse-power Active
also a 12th-horse-power Scriftner Active
that of the stitching angines exhibited,
also a 12th-horse-power Scriftner Active
factor built for a racer by the Jeniciek
Motor Company The Dean Manufacturing Company showed the 8-cylin
der 80-horse-power 4-cycle engine with
which they made their record run from
Bi. Louis to New Oriesan last year in the
First Pax III The Standard Motor Construction Comman exhibited
The Standard Motor Construction Comman exhibited
war double-cating 8-cylinder engine
used by the Russian government on its
submarrise The smallest and lightset marrise motor exhibited was the Weserman it horse-power 4-cylinder motor submarities. The semillest and light set marine notice exhibited was the Walter and the Walter and the Walter and the Walter and External State of the Walter and Walter and External Walter and Walter a



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Both number of the Scientific Americ MURRI & CO., but, Sel Symphony, New Yor (Oncoluded from page 18th)
both, two men angest to make the harardous 7-mile trip through the rapids and
the whirlpool next summer to Lewiston.

Caisada
The motor best industry, as mirrored by the 1916 show, is increasing by leaps and bounds. Aiready there are \$6,000 motor bests in use in this country, and it is sate to say that by the ond of another year this figure will be materially

THE FIRST ALEMENTAL REMOVALITIES SHOW AT BOSTON

The two general views of the Boston aeronautic show reproduced herewith will give our readers a good idea of how weil-filled was the large hall at Mechanics Building with the machines of American inventors at the recent show While a the lines of some of the successful Eu-pean models, most of them were pattern pean models, most of them were patterned after American models, such as the Cur-tiss and Wright biplanes and the Pfitmer monoplane In one of our litustrations a monoplane on the general lines of the Bleriot (the "Morok") with the silding Hieriot (the "Morok") with the sitting wing tipe invented by Pfitzner instead of wing warping, appears, in the foreground, while the large Antoinette type with triangular body and the smaller Ble angular body and the smaller Hieriot type monoplane were both axhibited by the Scientific Aeroplane and Airship Com-pany of New York Both of these ma-chines were constructed by Stanley Y.

Beach
Another general view of the hall shows
the former of these two monoplanes in
the foreground Another monoplane of
original construction (the "Burlingame") original construction (the "Burtingame") appears in the citize, while hanging from the ceiling is a hiplane gitder constructed and used by the students at Boston "Tesh," and just below this another gitder built by two boys after a description built by two boys after a description of the Arc Citis of N. S. is seen partially inflated in the center of the hall, while on the right-hand side are seen several balloon baskets, among them being that of Los Berren's small one-man of the hall of the control of the hall of the center of the center of the hall of the ce

carrying 20 passengers.

The l. A W hiplane and revolving The l. A W biplane and revolving cylinder 2-cycle motor was one of the novelties of the show. This biplane was constructed somewhat on monoplane lines, there being a rectangular body extending out behind and carrying the biplane horrisontal rudder for steering up and down. The motor was mousted on truminons close in front of the mean targets where close in front of the main pianes, which mounting makes it possible to direct the propeller upward slightly when the machine is running along the ground in order to rise. The new revolving-cylinder motor used on this machine is said to be one of the lightest motors of this type yet produced It is soon to be put on the market in two sizes of 50 and 100 horse-

Bestides the seruplanes shown in our photographs, there were numerous other full-ties machines. Most of these word described in our last issue. A Farman machine like that used by Farman at Printon Beston in 1100 was put on exhibition when the show was half over This machine was the only aeroplane said to have made a short flight previous to the opening of the show

THE UNIALABORD BULLEY.

THE VERGLERY DEPARTMENT STATES, (COnsistence from page 201) based, indicated plainly that the cause, so simple actor discovery, was not own surmised. Their attempts to reduce it were based upon the theory that the blast of powder gases at the musside, are some condition of the rifes hore at the musside, are accountable of the property of the areas. some condition of the pitch burs at the mussic, was responsible for this appear at modes change in direction of the ballet's flight at this plane. Persistant sevens shareling and contin-ued climination of errors that were (Concluded in page \$4.5.)

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(Concluded from page 210) en, indicated clearly that error was not the only error Another chase was at work which added to or subtracted from the X error, and while nting for this the author desig mated it the "Y error."

sated it the "Y error."

He had known for years that tipping bailete make a spiral flight as they pass through the air E A. Leopold determined the dismeter of some of these spirals several years ago. It was generally believed that a builet often makes a spiral flight over the rauge, and the cause. rai flight over the range, and the cause of this Y error at the target seemed to have some connection with this spiral in the air, which nearly all unbalanced builets describe. The author's own screen shooting exhibited clearly the diameter of many of these apirals and the distance or many or these apirals and the distance from the muzzle at which the spirals commenced. He found the cause of the Terror to be as simple as the cause of the I error

The X error spiral ends at the musale, hile the Y error, in the air, commences The X error spiral ends at the muszle, while the Y error, in the air, commences about 12 feet from the muszle. The bul-let makes an apparent change in its di-rection when it leades its X spiral at the rection when it leaves its X spirral at the musais, and it makes another change in its direction when it goes into its Y spi-aid. The resistance of the air upon a tipping builet produces its air spiral, and the rigid wails of the ride barrel pro-duce the X spiral described by an un-bianced builet in the bore The pitch of the X spiral, or the distance of one outra of the spiral to the next, is the same as the ride twist which for a 0.32 cullber is about 12 inches The pitch of caliber is about 12 inches The pitch of the Y or air spiral is about 46 feet

the f or air spiral is about 46 feet.

The diameter of the bore spiral varies from a fraction of a lhousandth of an inch to several thousandths of an inch. The dismeter of the air spiral varie from a few thousandths of an inch to 7/16 of an inch, depending upon the amount the builet tips in its flight. The

amount the bullet tips in its slight The air spiral, or course, results from the fact that the tipping bullet does not point in the direction of the slight The causes of these two errors, X and T, are the same in principle, but their positions are reversed. The workings and explanations by actual experiments, wall illustrated, are set forth very eaborately by the authorized and the set of the very eaborately by the authorized and the set of the very eaborately by the authorized and the set of the very eaborately by the authorized and the set of the very eaborately by the suited.

The following onclusions may be drawn from the bok

drawn from the bok in careful weik argst work, under favorable shooting conditions, the X+Y orror at the 100 or 200-yard targst is about 80 per cent of all errors. The y and Y results from the fact that the tangint of a spiral $(c\cdot)$ forms an angle with the axis of its spiral $(d\cdot)$, as may be seen in Fig 3. The builet as a whole makes a spiral fight while in the rifle, because it is unbalanced or because it is unbalanced or because it. does not lie central and straight with the bore It makes a spiral in the air be-cause it is a tipping bullet. It is a tip-ping builet because it was unbalanced when it left the mussic. The unbalanced ween it set that mussic. The unbalanced hullet, with respect to the center of the sife bore, is therefore the prime cause of its X and Y errors.

rent in the rifle and its ammunition, the rent in the rife and its ammanilion, the huitat, before being shot, must be a bal-anced one, that is, its center of gravily must ceincide with its center of form. The powder charge must produce uniform pressure from abot to shot. The rife, harrel and ammunition must be so con-structed that the projectile remains bal-anced throughout the entire bore

To have a projectile start from the mussle in the right direction, that is, in mussic in the right direction, that is, in the line which forms the center of the bore, the entire builet just as it teaves the mustle must be symmetrically bal-anced around the line of fire Apy rea-sonable rifleman would admit this last gatement. What the author's work has disclosed, however, is to point out clearly the fact and its importance, and to show the net and its importance, and to show mathematically that practically the whole error at target attributable to the mod-er's rifle and its ammunition originates in the unbalanced projectie.

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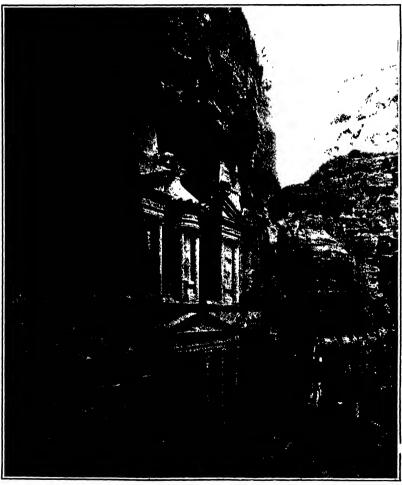


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NEW YORK, MARCH 12, 1910

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This is in most reports the most remerkable of the boundful temples and nonlocal First, the next here explaint from an later of the Valutions—where him Arms, monthment in it will be a supported in the property of the prope

SCIENTIFIC AMERICAN

ESTABLISHED 1845

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Buttebad Weekly at No. 361 Broadway, New York

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THE SCIPATIFIC A WEITER A N. P. BERGAZIEVEN
SCIENTER AND THE ALL WEITER AND THE SCIPATION OF SCI MINN & CO. Dor. and Browlessy New York

NEW YORK SATERDAY MARE IT 1216 1910

The beliter is always that to receive for examination illustrated on diagona of the lymbored. If the photographs are sharp, the short and the province will previous authorite the contributions will previous attention. Accepted articles will be paid for a requisite place form

THE "WHIP-CREATION' BATTLESHIP

tile Washington correspondent who is re-sponsible for the distribution of payal and military news to the stally press of the country has been writing some extremely sitly monstens, about the two battleships which the House Naval Committee has recommended for this years programme, and he has put into the month of been tarry Meyer statements as to the objects which have insolved the request for these two powerful was have inspired the request for these two powerful was sets which we are perfectly satisfied the Secretary could make him to the roll According to the dispatches the motive responsible for their impresedented size, reported to be from 8,000 to 3,000 tons, is the reported to be from \$0,000 to \$2,000 tons, be the desire to built a couple of ships which shall be blacer than nurthing else utloat and give to this matten the prestige of proceeding battledding which in respect of size and terror producing qualities about be supremely of the white continu' order

It is sufficient to say one and for all that the day of while-cention sentiment has long ago possed -if limbed it ever existed except on the street or in the If third if ever exhibit except on the street or in the muscle full balled. Certainly, it was never motive in the optautiding of the Inited States may. Our frig-alise of the sulling days were built swifter and at acad stronger than the ships then afford in other masks not for the variagions of being take to say that they were swifter and more heavily armed but for the very practical purpose of overtaking the enemy bring ing blue to action and crossing blue to superior gun The polley of that carry time has been the polley of our mass in the intersening one handred years at lt is its patiev to-day if Secretary Meyer believes it to is expedient to build a ship many thousand lone larger than anything contemplated abroad we may rest assured that it is because he and his naval ad viscus is they that to anniutation our traditional an performs in gon fire we must move up from the 12-linch to the Himch gon and increase our dispincements in proportion

most efficient bartleship is the one which bodies the maximum amount of all round nellitary of ficiency on the minimum amount of displaces. Unless the present theories of naval designers much of fautt, a ton of displacement in n big battleship gives more military value than it does in battlishing given more millitary value than it does in a help of smaller raise? Thus 2000 tons in a Delawarr is a more valuable most than the same displacement in two 'Uresons'. Here then is another cause of Rel'apuld growth in revent vars in the tennage of the first-loss flighting ship. From the 12 500-ton 'Maline' out ablies of the first line have grown in brough the 14,000 tons of the "One-thirt, the 20 1000 tons of the "One-thirt is the 25 000 tons of the "One-thirt is Arkansas and Wyoming' which are now upon

the sireba
The big jump of 2' per cent in displacement between the "Connectius" and North Daktota" was due to the counting of the diseasement between the the connection of an ext insiste unital arinament of 12 facts guaranteed on the connection of an ext insiste unital arinament of 12 facts guaranteed on the connection of the sister of the connection o and power of the observer tent claim by the substitution of the 14 link for the 12 link gun. The House Committee on Naval Affairs has accepted we are glad to see the Secretary programme for increasing the force of the navy by two battleships two fleet colliers. one repair ably and four submarines of a new lype of unusual speed and steaming radius. According to the provisions, the ballieships are to be of at least 26. tons and each ship is to carry len 14 inch guns, the

ships being made of sufficient displacement to carry this battery. The 14 linch gun, however, with its mount ammunition, etc., is so much heavier than the 12 linch that the new vessels even though they carry twelve such guns, will have to be of at least 28 000 tons displacement, and if it should be decided to mount twelve such guns, the displacement may run up to

is where such guns, the displacement may run up to 400 tons and over Because of the greater punishing power of the 14 lach gun at long ranges, a battery of ten 14 lach would greatly outmatch one of twelve 12 then 1 here is no ship affont or contemplated so far as we know, among the navies of the

HIGH-APRED PRIRORAPHY.

HIGH-SPRIT PELEBRAPH.

SIME very remarkable testimony has been efficied by the Joint Committee of the Legislature which is investigating the question of extending the jurisdiction of the Public Service Commission to and over telephone and telephone prompanies. It for runarizable as seculing to indicate that in side of the targe amount of thought, and mechanical skill which have been discussed in the commission of the service and the service a gausty, and mechanical skill which have been di-rected with marked success during the past few de-sades to the improvement of the speed and lowering of the coat of referrably prescribally the whole to the business of the bit telegraph companies is to-day sent by the hand-spearted Morne key, in much the same way and at no greater speed, than when Morne first was a supported to the same of the same of the most referrably as marked commercial art. The according to the testimoty of Col. Clovery, president-mission is obtained in their service by two systems, the Wheatstone and the Barclay the former having a capacity of 125 words per minute, and the latter of 90, will an average of about 50 in gractical use, would se and these two forms of apparatus, it

and those two forms of appearatis, it would seem, represent the only departure maile by the Western Union Company from their almost universal practice of operating by hand by the Morose key.

Bide by side with this evidence testimony was atten that rapid telegraphy systems have been developed here and in Europe with capacities of from title 10 several end over one system, stabilished in several coulers in the United States to great the several coulers in the United States to great the several coulers in the United States and the several coulers are several to the system of the several countries why do not the take graph consenses make use of the system companion of the several countries. In this testimony tells only explained that the Western I united is not reverse beginning and that the company cannot hold message multi they get a sufficient number to send messages multipley seed a summer conductor to assert as in 1000 world on hunter and this is true as regards the single-short message but in the case of the longer message approaching the manuscript belief length; the type of bushins which would be certain of enormous developing if it were offered to the public throughout the whole twenty four hours of the day of the low rules which would then be assulble Its day at the tax rains white would then be possible —
It would be previously in purching the scaling tages
and the message could be sent through in less than
one tents the time that it would take by the gresent methods The transmission of Peary's 8000-word message from Indian Harbor to the New York Times was quoted as a great feat in telegraphy lit took a was quoted as a great feat in telegraphy it took a force of levelly operators three days in a fit the resease librough is the raidd telegraphy system the anne message after being prepared on the tope could have been sent over a single line in about ten minutes?

The high speed methods as worked out by Hughos,
Murray, Polisk Virsa, and Delany elaim 10 word at
the rates respectively of
4 500, 15,000 18 600 and
The significance of these 60 600 words per hour The significance of these methods to the public is that by their use the telegraph could be extended cheapened and popularised until it was as available to the ordinary citizen as the far more highly developed telephone of the present

WYW YORK AND PARTS STRWAY SYSTEMS COMPARED. EW YORK CITY is justly proud of its subway system, but it will be a surprise to some of us to learn that the subway system of Paris us to learn that the subway system of Paris extually carries a larger number of phasen-gers during the year, the total being 333,000,000 as against 200 00,000 cervide on the New York system. Outside of the mere fact that more people were carried the comparison is entirely favorable to the New York subway. The details of the following comparison have been worked out by R II withten, the final trian of the New York Public Barvicas Commission, and they safford upon a most timely subbed is mean of valuable information, which is a creat contract of the comparison of the New York Public Barvicas Commission, and the parison of the New York Public Barvicas Commission, and the parison of the New York Public Barvicas Commission, and the New York Public Barvicas Commission of the New York Publ

piler and cannot rail to or great service to the Commission in its important work of regulating trans-portation matters in this city. There are certain points of similarity between the lwo subways. Both have been built and are evased

by the city, and both are leased for a terms of years to an operating company. The length of the two systems in miles of singls truck depended was in 1869; the year for which the iston figures are available, very nearly equal. But the Paris system, which is entirely-two-track, forms a network of lines covering a district having a radius of three or four miles from the business or traffic center, whereas the New York system has a single seen terminating in two long forts at the upper end, and extending 14 miles to its most distant point from the Brooklyn Bridge, which may be called the chief frame center The Paris subway has no express service, whereas the New York subway has four tracks carrying express and local service for six and a half miles through the most congested dis-

The population of the district served by the subway system was 2,750,000 in New York and 2,780,000 in Paris The area of the city proper of Paris immedia ately tribulary to the subway is 31 square miles, the area of Manhattan and the Bronx served by the area of Manhattan and the Bronz served by the sub-way is £2 square miles. Hence the population of the district served by the Paris subway is more than twice and dense as that served by the New York apriam. There is a total of \$48 miles of single track in the New York and 652 miles in the Paris subway. The great superiority of the New York system is due to the frequency of the trains and the higher speed of travel. In Paris during 1996 the least head-way during reads hours was 5 miles and 25 seconds.

way during rush hours was 2 minutes and 33 seco and the greatest 7½ minutes. The least headway in the rush hours of the express Irains in New York was 2 minutes and the greatest 4 minutes. The man mun length of the Paris train was 236 feet, of the New York train, 411 feet. The average speed in the Paris subway is 12 miles per hour, and in the New York subway, 18 miles per hour, the average speed of trains between Brooklyn Bridge Street being about 24 miles per hour and the sver-age speed of the local trains about 15 miles per hour. Are speed of the local trains about 15 miles per The maximum speed in the New York subway is 40 miles per hour, as against 217 miles per hour in

The rates of fare in Paris are first class 48 cents, second class 28 cents and second class round trip tickets 18 cents equivalent to 19 cents per trip in York there is a uniform fare of 5 cents, but while ride per passenger is from two to two and a half ti that in Paris the fare in New York is 5 cents, the average length of

In Paris the capacity of each car is determined by the government, and in 1908 the awrage number of passengers per car was 64. The capacity of the New cars both scated and standing estimated on th Parls hasis was 10% but this frequently rises to 150, and even 170 passengers per car in Paris the numand oven 170 passengers per ear. In Paris the num-ber of standing places is fixed by the government, in ber of standing places is fixed by the government, in New York the limit is apparently fixed by the ability of a burly platform guard to boost the passengers in by a well-directed football runth limit wore the gov-ernment allotment of floor space, as obtaining in Paris applied in New York, the maximum capacity of a New York subway car would be cut down from 170 to 103 The number of passenger place-unites per mile of track was 73,000,000 for New York and 36,000 000 for the Paris system, and yet as we have seen above the Paris subway, because of the shorter length of the trips carried a greater number of passengers in the

year Congestion in Paris is not nearly so great as in New York, first, because Iraffit is more eventy distrib-uted throughout the day, secondly, because the cur-rents of traffic in Paris move in both directions during rents of traffic in Paris move in both directions during the rush hours, and thirdly, because the passenger in Paris takes a shorter average ride, and vacaies his place for others. The longest possible ride on the New York subway is 1714 miles, though it is not probable that many people take the trip from Atlantic Avenue, Brooklyn, to 222nd Street, New York, for the Avenne. Brooklyn. to 220nd Street, New York, for the pleasure of the trip, and cretaliny not many for business purposes. The total cost of the New York submess purposes. The total cost of the New York submers and the requipment was \$81733,000, cresisting of \$81,280,000 actually paid by the city for the contration of the subway and \$37,845,000 thick its contration of the submay and \$37,845,000 thick it claims to have spend in Lebourge 100,000 that the company rolatins to have appended for both equipment to the submay from Procklyin Trips below Procedure and the Sant River to Brooklyn The total cost of the construction and evaluations of the Paris subways a sectimated at 1843,551-

The New York subway fared much better this Paris subway in the matter of taxes, the former paying hut \$900 per mile of single track as against \$4,200 per mile paid by the Paris subway The New York per mile paté by the Faris subway The New Yerk mulway considered as an economic undertaking earned about 7 per cent on the capital juvested, while the operating company earned about 7 were once as for reported intrestment. The Farth subway casued 7% per cent on the total estimated coet of conjustration and equipment, and the operating company carrond 8 per cent on its reported presentation.

Scientific American

ENGINEERING.

cost wreck on the Lendon & Brighton Railway, ad, when an express left the rails and crashed into the ratiway station, has again illustrated the ligit construction of English cars A Puliman car was conparatively little damaged, where coaches were completely wrecked. reas the ordinary day

The new single-phase electric freight locor which has been built for the New Haven Railros wance age seem unit my tae new haven kalifond was recently given a test between Naw Rochelle and Stam ford, a distance of 17 miles. The load consisted of thirty loaded freight cars, and the distance of 18 miles was covered in 27 minutes without pushing the engine to its full capacity

In a page before the Engineers' Boolety of West ern Penanyivania, E. F. Bulmahn described a new type of bluminous gas producer withch embodies the good features both of the sporfark and the dewadraft type currooming the production of tar and comploiday con-sming the kind carbon. There are two feat both conceptants are a down-first producer to break up the one operated as a down-drain producer to several violatile matter, the other as an up-draft producer to congume the fixed carbon, the resultant gas being taken off at the center of the producer

taken off at the center of the producer

Times was when it took nearly est years to build
a battleship in private yards in the United Sisten,
but the construction of the "Connecticut" and
sesselly accelerated. The "Mississippi," whose trials
took place as recently as October, 1907, took 44 months
took place as recently as October, 1907, took 44 months
took place as recently as October, 1907, took 44 months
occustred. The "New Lampshire" December, 1907,
was belli in 38 months, the "North Carolina",
(crellery), January, 1908, in 1819, months, the "Delivere"
(textilenily), 1909, in 1819, months, the "Delivere"
(textilenily), 1900, in 1819, months, the "Delivere"

(natically), October, 1909, in 17 months was inspressman are being made in the Trans-Siberian Railway which, in addition to being doubt-ranked. Is being largary reduced with a view to the elimination of grades and the shortening of dis-tance When the work has been completed the chance from Paris to Peking will be 5,000 miles instead of 7,500 miles over the present line size Harbin and Mukken, and the fourteen days now consumed on the reduced to nine and a haif days. The e improvements will be as great from the passonger and freight traffic

Speaking on the relative economy of the single and dire ct-current eyetems for steam ratiroads phase and direct-current systems for steam railroads Mr Gorge Gibbs is of the opinion that maintenance coats of the single-phase system as at present developed will be somewhat higher than for the direct current though eventually they should be about the same. On the other hand, he estimates that about 13 per cent less thangy would be required at the power house for the situations that for the direct constant the situations has for the direct constant. the eingle-phase than for the direct-current system Adding the saving in substation operation, he looks for a saving of from 4 to 5 per cent in the total operating cost in favor of the single-phase system

The tremendous floods of the past season on the lath-mus of Panama have helped to demonstrate, even be-fore completion, the wisdom of building a high level rather than a see-level canal. Through the swamp near Gatun the bottom of a sea-level canal would be near Gatto the bottom of a see-level canal would be some 50 feet below the general ground level, and at Ganbon, where the Chapter River pours its enominan and sudden floods serous the canal cut, the river bed would be 50 feet above the canal bottom. Under the tremttall downpur, the discharge of alluvial silf: into the canal would make necessary constant deciding and might result in the temporary obstruction of the

and might result in the temporary obstruction of the channel.

There is great softwity just now in experimental work in the direction of speed-reducing many formarine torbines. We noted in our facts of February to the contract of the cont

AFROMAUTICS

The latest German airship— Parseval V "—left Bil-terfeld at 10 15 A. M March ist on a voyage to Berlin The capital city was reached safely the 30 miles being The capital city was reached safely the 50 miles be covered in 4 hours. This airship is the smallest n enger-carrying dirigible yet constructed Its rngth is but 30 meters (90 feet)

With the same make of 50 horse-power revolving-cylinder motor used by the ill fated Delagrange, and which drove his machine at the rate of 50 miles ao which drove his machine at the rate of 50 miles an hour, Le Bion few 10 kilometers (621 miles) in 8.74/5 (45.82 miles per houri and Ralsan 6 kilometers (21 miles) in 4.1 (46.39 miles per houri at the first foreign avietion meet of the year at Hellopolis, near Cairo, Egypt Both ware awarded prizes.

The 1910 model Bieriot monopiano has a body only The 1940 model Bierick monopiane has a body only of entering tild forth in leady. The body is compliedly correct There are wide horsential flux on each side at the erest, forming a tall, and the horizontal rodder is in two parts, one of which is hinged to the rear edge of each fin. The tall resembles that of the AltoInstite monopiane, but Bierick allil uses a vectaging threated in body instead of the Valanced forms which imparts to the Antoinette machine its excellent trans

The recent decision of Judge Hand against Paulhan in the Wright brothers' suit, the granting of a pre-liminary injunction, and the requirement of a \$25,000 bond for one month in case Paulhan wished to con-tinue his flights, has put a sudden ond to the making time has fights, has put a sudden ond to the making of exhibition slights in America by this daring record breaking Frenchman. The bond was reduced to \$12,000, but Paulhan's manager although under contract to pay him \$6,000 per week has brought the aviator to New York to await the result of an appeal. The case will be reopened on the 12th instant

Gen. Brun, the French Minister of War a month ago impected at Viliacoublay the four Wright hiplanes which have been hullt for the Freuch army Count Lambort explained the mechanism but made no trial flight because of an extremely high wind. At the same time the army Antoinette and Farman machines were insported at Mourmeion by an artillery officer, Com-mandant Estienne On the 3rd ultimo Van den Born mandant actionse On the 3rd utilino Van den Born made a 36-minute fight in one of the Parman biplanes, carrying a neeful load of 201 kilogrammes (444 pounds) On Mark 1st Lieut Cammaran of the Engl Beer Corps flow 38 miles in a similar machina. Birliot also has been instructing Lieut. Aquaviva with ett.com

A man who has made a thorough investigation of the accident to the Bieriot monoplane which cost tha life of Leon Delagrange, has concluded that the acci-dent was the result of the aviator griting "rattled for an instant when he was flying low and was about to turn it is this man's belief that Delagrange threw turn. It is this man's belief that Delarrange three the same lader this warping the wings too much and tipping his machine severely—and than to art to the other the result being that machine seward so violently that it turned over it struck the around quested own, and all the guys ele on the under side were found intact. A spering air with the around the side with the same side with the same side when the winds with the same side when the winds with the same side w been left out) was found in place and unbroken. As far as could be ascertained, everything was in good order and the accident was not due to the failure or breakage of any part of the mechanism.

Now that Germany has produced several "men birds" many new acropiane inventors are rapidly appearing. The majority of these favor the monoplane, with which type the first \$10,000 cash prise (the Lam prise) was won by Herr Grade last tail. Dorner and Hilman are won by Herr Grade laght fail. Dorner and Hilmana new from of the latter, successful experimenters with this Upe of aeronefs—to whom should be added Major non-complete the state of the state of the successful and machine is undergoing its prelimitary tests on the shore of the latter at Plan in Meckinshing. On March life Herr Paul Lauga attempted the first aeroplane flight to be made at Drusdon. He rose to a height of flight to be made at Drusdon. He rose to a height of the state of

tor secuped with had bruisse

The making and flying of model aeroplands in a wicutific diversion from which much may be learned
flowered interesting new forms of seroplanes have been
flowered interesting new forms of seroplanes have
been the seroplanes of the seroplanes have
been the seroplanes have been the seroplanes have
been the seroplanes have been the seroplanes have
been the seroplanes have been the seroplanes have
prizes, which was hadd in the 60th Rectinest Armore,
New York witz, or the seroplane of March 1 crt.,
was happy throughed. Several small moneplanes having
flowes made of wood were flow by L. J. Lash
Mankanian had a Langer-type machine with 4 large
legislanes, new at either corner All the models are
legislated from a table. The longest flight—146 freetvies made by the monoplane of Prederick Walten, a
Mysar-old hay. Other contents will be held weekly
as, the symptom.

SCIENCE.

Prof. Herschel C Parker of Columbia University announces hie intention of attempting to ascend the Alaskan peak, Mount McKinley He states that either will reach the summit or prove that it can hed only by an aeropiane

The alcohol produced from sawdust and wood mus not be confused with wood alcohol, for, although standard alcohol is primarily made from wood, it is produced directly by the formentation of a pure sure solution, into which the wood is first converted, and it is the same, both chemically and physically, as the alcohol made from grain

alconot made from grain

Fund Ransumsen, the explorer, will sail in June
for Greenland on an expedition which will consume
for Townsen for the choographic toxify of the Education is
the purpose of this expedition. One year will be open
to Cape Vork and a year each at Hudons and the
Crown Baye. After the savelgation of Rathon Bay Ramuses Experts to irrumans/quick classics and to sail
muses Experts to irrumans/quick classics and to sail to the Alcutian Islands and return via San Francisc

to the Adouthan behade and riture vie San Francisco.

Sift Praces II Shakelston, the Attactic explorer,
who is to lecture in this country, will arrive on the
Lusticatio on March 28th Berbor the explorer learner
Washington, where he will be the guest of Ambassator
Bryce he will revelve from President Taft the goet
modal of the National Geographical Society White
in New York he will be presented with the gold model
of the American Geographical Society of New York

Prof. B. B Barnard of Yerkes Observatory informs us that on February 77th last he obtains d with a one-hour exposure a photograph of Halley's co one-hour exposure a photograph of Halley's ubowing a faint tail of two degrees, equivales length of about fourteen million miles 'i rather important in relation to the question et to a whether the tall will reach the sarth on May 18th From these photographs taken so far from purihelon, it seems that the tail will be amply long enough to reach the earth

The Royal Geographical Society of Italy, et a largely attended meeting ratified the recommendations of the committee relatively to the bestowni of medals and other committee relatively to the bestons at of medials and olims distinctions for the year 1900 Three include a gold model to Robert & Pears, for the discovery of the North Pole, after used in Capitals Robert A Barrielt, who commanded the steambhly "Rosewell" on the Pears yearefulton gold media to Lieutonant Rir Ernest II Shackiton, for his "nearest Soulh Pole". Sulver 1804 to the third of the Advanced for his exiter 1804 to the black of the Advanced for his extension of the pole of the North Pole of the Pole of the North Pole of the North Pole of the Pole of the North pedition to the Himsia, as where he made a reco

The moving picture is now applied to co The moving mesure is now applied to curvational ruppess. Chemical tests are now 'xibibited on the acreen There are films illustrating the electrolysis of water, scrittor of nitric acid on aliver and action of aqua regix on metallic gold etc. The test tube is thrown on the screen many times enlarged, and the chemical action is clearly limitrated. Most unsavory but educational is a film illustrating the peril of the out containment is not insurrating the period too fly. The fless are shown laying eggs in unavery places and before the eyes of the spectators the eggs develop in heaps of wrighting mangots. In the final stage the winged fly is shown in all its unsanitary slory. Still another flio exhibits the arobatic fly sying on its back juggitog various articles with its feet and even swinging a dumb bell as large as the insect limit

In the possession of Knor Hall of Natural History with His Invaluable specimens Hamilton College is specially fortunate. By the bindness of the Hon James Knox, LLD "70, the original building was reconstructed into a hall suited to the display of all sorted streets and suited into the display of all sorts of matural bistory specimens. The most important collection specialities in that of the New York State minerals, degisher with related minerals from Canada. Among these specimens are Yound many rare once the In the possession of Knox Hall of Natural History conjection gas against in that of the New York State the Conference of the process of the process of the conference of the process of the pro ware a parge and valuable collection of butterflies, appropriately mounted The Hail of Natural History is under the charge of Prof William John Miller, Ph D, an eminont authority on geology and minorations of the Collection of the Collection of the Good Collection of the Goo ogy of the Remen Quadrangle including Trenton
Palls and the vicinity in Oncida and Herkimer coun
ties. This book was published by the University of
the State of New York as Bulletin No. 126 of the Edu-

DRIVING PILES WITHOUT A PILE DRIVER

BY GEORGE H. LODGE

It may be of interest to many of the readers of the Scivitize Assessant to learn of an easy method of driving piles through the ice without the use of

Those who have tried to drive even a small post Those who have tried to drive even a small post by hand while working in water or from a small boat have found it much more difficult than one would at first suppose. I was myself confronted with the problem of building a dock landing for a lake steam bestle a steamboat built to carry 300 passengers, be-ing 70 feet long. The problem was to build a dock or landing safe and large enough to handle the people

rapidly

First we thought that it would be necessary to hire
a pite-driving outfit, but my father, R. H. Lodge, devised a plan that works to perfection
We select straight withte oak piles not over one foot

We as let straight white oak piles not over one root in diameter at the but which are unt to the length required usually from 20 to 36 feet. These are sharpened at the butt ends to a point sod with an κ κ through its out from the point of the stick back from three to four and one-half feet, according to the size of the pile

it is important that the threads be cut as nearly the same distance apart as possible. A good man with an ax can soon cut threads that are mechanical. il is asionishing how many, with a little practice, can It is assonishing now many, with a little practice, can be cut in a day. It pays to use special care to the cutting, as it beine wondorfully in the driving. Piles that are from ten to twelve inches in diameter should have threads from three to three and one-half inches apart and Iwo to two and one-half inches deep

apart and two to two and one-nair monds deep After the inreads are cut the pole is ready to drive, which is done by chopping a hole through the ice at the desired apot, being careful not to make the hole the desired appl, being careful not to make the hole-one two inches larger is diamoter than the pole, and have the few act as a guide to keep the pole upright while arrewing in down.

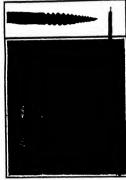
If the pole is long and heavy, it is necessary to fasten three guy ropes to the top of it before raising After the pole is raised, it is an easy matter to keep it plamb by quilling the ropes.

The pits is raised like a roumon (relephone pole to there works, a little at a time with pike poles, follow

ng up under with two planks spiked together in the n of an X.

form of an X.

It is a good plan to stand a plack in the hole and to let the point of the plie rest against it, as it assists in placing the plie in the desired spot



DRIVING PILES WITHOUT A PILE DRIVER.

It is also a great help to spike a short plank acro the pile, temporarily, just above the threads, to keep the pile from shooting under the ice before it is vertical whereupon it may be knocked off. The pile

will thee drop into the proper place Now you are ready to bind a pole (or sweep lever)

to the pile. This is done with a common log chair, care being taken to bind it so that it can be serwed in the right direction. Hitch a sharp-shod horse to the outer end and lead him around the pile (capatan

fashion)
It is an easy matter now to serve a large pile from
four to sight feet into solid clay or gravel or to unserve it and remove it

The accompanying photographs illustrate the woodsub-radir radio for use, and the plan of servering in
stream radio for use, and the plan of servering in
offen put in smaller poles by hand, using two of
three mes instead of a Borne.

We have roomity taken out two steamort to posts
that have been in use for sight, years, having begun
to decay. These unserveled posts we found had been
sary to hitch the lever below the water line, where
the wood was secured, in order to chart them.

the wood was sound, in order to start them.

To the Cairo Scientific Journal for January last

Mr B P E. Kesting communicates an interesting
paper on climate changes in Egypt. There is a strong
sileif among residents that changes have occurred
within the last ten or twenty years (possibly due lo
increased triguistion) which are distinctly "sensition" to
the mean temperature at Abhamis for each pentade
from 1870 to 180, and for the foor years 190.5, to
the results show that the differences are hardy
restart than might be caused by difference of expsure of the thermometers. As regards humidity, size,
there is very little evidence of each of the comterm is represented by the company of the comterm in the company of the comterm is the company of the company of the comterm is the company of the company of the comterm is the company of the company of the comterm is the company of the company of the comterm is the company of the company of the com
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the company of the com is little, if any, evidence of such being the case. The total rainfall of any year is often influenced by the total raintal of any year is outen inneneese by tail on a slopte day, and is consequently very variable from one year to another, the driest year on record at Abbasais at 1858, with little more than a quarter of an inch of rain, and the wetner, 1904, with loss than 3 inches, the mean for 1887-1908 being approximately 1.5 inch.

AN ARTISTIC REINFORCED CONCRETE BRIDGE

A COMING TYPE FOR COUNTY HIGHWAY BRIDGES

In country districts where the materials are readily accessible the reinforced concrete bridge simuld prove to be an ideal system for the construction of concrete bridges of moderate span. We say of moderate spau, for the reason that the art of trussed bridge construction in reinforced concrete is as yet in too early a stage of its development to warrant its indiscriminate use in bridges of considerable span. In structures of moderate iough, say up to about eighty or a hundred feet, if care is taken to proportioning the parts, especially at the joints, and very particular care is taken

in securing a thorough between concrete and steel, the county com missioners or other su thorities should find the ocrete steel bridge a reliable and economical type. It is easy to erect, it requires no painting and practically no mainleo ance whatever, it is in destructible by fire or the action of the weather, and its subsequent cost fer maintenance should be practically nothing at all

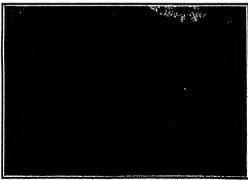
The accompanying illustration shows a bridge of this class of the bowstring type which was receolly built in Caosda. It has a span of 80 feet and provides a clear roadway 16 feet wide. The total weight is about 160 tons, and it contains about 19 tons of reinforcement in the form of plates and round rods.

The bridge was designed to: carry a load of one bundred pounds per

square foot evenly distributed, and it was tesled for this load with an additional load of 35 tons repred hy a herd of 70 cattle

On the score of appearance it must be conceded that the design is decidedly pleasing the intersection of the balustrade with the chord and web members having been worked out with considerable taste. The structure spans the Etobicoke River, in the counties of York and Pecl. Canada

No sooner had the first modest attempts to steer



A RECEPCION CONCRETE RELIGIES OF ARTHUR RECEIVE.

or less success, than endeavors were made to direct the course of balloons and seroplanes in the same the course of balloons and seroplanes in the same manner The American engineer Anthony has made axperiments off Sandy Hook, with a small unmanned dirigible balloon, which he succeeded in guiding more than a mile seward and hringing back to the point of than a mile seaward and nringing back to me pount or departure Prof Wicchert suggests the employment of unmanned aeropianes for the study of atmospheric alectricity and has designed an apparatus of this kind it is obvious that such an apparatus, equipped with the necessary instruments,

the necessary instruments, which could be sent to great heights without dan-ger and brought back with cartainty, would be much more useful for the study of the atmosphere, as especially that of atmo pharic ejectricity, than un anned registering balmanned registering bal-loons, the recovery of which is always a matter of chance, or manned bal-loons and kites, the use of which is not unattended of which is not unattended with danger in stormy weather Bailcogs con-trolled from a distance by alectric waves would also be very useful in the res-cue of shipwrecked per-sons and for many military and other purposes. But —and this objection ap-plies also to the wireless divertion. plies also to the wireless direction of ships and torpodoes—it is a long step from successful ex-periments in favorable con-ditions to uniform suc-

Instrument for Detecting Violations of the Speed Laws

BY L. GORDON GLAZIER

A very ingestious instrument for recording the speed and license number of an automobile has been expressed and license number of an automobile has been expressed in the stations of Technology. The instrument, which is but little larger than a pootet tooks, consists of a desired commers with a watch movement which controls the operation of the centers shutter. When an automobile passes at a speed that seems assessive, the operator trains the instruments until and releases the mechanism by pressing a hutton, immediately the shutter of the more camers is some

stely the shutter of the upper camera is sprung



DOUBLE CAMERA WITH WHICH VIOLATIONS OF THE SPEED LAWS ARE DETROTED.

taking a photograph of the receding automobile, ar taking a photograph of the receding automobils, and a moment later the other shutter is aprung, taking a second image of the automobils, whereupon the timing machanism comes to a stop. The plate is developed by the regular process, and the resulting negative shows an image of the automobile near the operator with its license number distinct, and a second view with its invesse number distinct, and a second view of the machine taken at the end of the time interval In the center of the print are the photographs of the hands of the stop watch caught when the first and second exposures were made.

Since the automobile has traversed a certain space

in the time interval, the second image is smaller than the first by an amount which can easily be measured with an ordinary scale, divided in hundredths of an inch; and knowing that the standard wheel tread to 66 inches, the distances of the two objects from the camera and hence the space the automobile has covered in the time interval is easily found by the following law The distance of any object from the reliouving line. The distance of any object from the iens is as many times greater than the forcal distance of the camera as the length of any line of the read of the camera as the length of any line of the read of the camera as the length of the property This known assumely, the size of the object the size of the intege of the object on the plate, and the distance of the object on the plate, and the distance of the object from the lens, follows by almple division. However, the operator is smed all principum computation by a table stateled to the instrument

to the instrument

To overcome the possible objection by the couris,
the watch has been designed so that the operator of
the instrument may actually see it during the process the instrument may actually see it during the process of taking the picture. This is made possible by aim ply borting a loole from the outside of the camera box to the back of the watch, which brings to visw a dial around which travels a hand attached to the amplitude of the watch in the picture of the watch piloton or staff as the regular hand of the watch in order to see this dist more plathy, two mirrors have been pisced permannity! in such a manner as 10

The instrument gives extremely accurate results, and can be calibrated from time to time on objects of

welcomed by autoists as well as police. It is an im-partial judge the personal element being entirely eliminated. A motorist who has been stopped does eliminated A motorist who has been stopped doce not have to rely on an officer a ceilmate of the speed, nor on the speed claimed by the officers operating a trap by means of stop watch and signals * Donesn of motorists are flighting (asses overy day who honestly believe that they were not overspeeding when stopped They would be perfectly willing to just their final it convicted they was adoluted that her. Even stopped lacy would be perfectly willing to jay their fines if covrinced they were violating the law Even where the more rational view is taken that the speed sions shall not determine whether or not a man is violating the law, but that the speed taken in connection with the surroundings shall determine it it is tion with the surroundings shall determine it it is stating a quotient on the officer's word against always a quotient of the officer's word against as to surroundings. This photographic speed of autious's as to surroundings. This photographic speed speed to see the automobile whether people were created speed user the automobile whether people were creating group to run at the speed indicated, or more than ordinarity sate.

A great advantage of the instrument is that it recording the speed of the speed of

similar situations, it offers the only existing method of measuring momentary hursts of speed. The record of measuring momentary hursis of speed. The record of any reckless driver can be easily obtained and a print sent directly to him, when he cannot deny the evidence of his own eyes, and in many cases an ar-rest will not be necessary, as the offense will not be

Regarding the legality of this speed recorder in a rocunt case that was strongly contested Judge Ham

mond of the Massachusetts Supreme Court said "The result of the evidence did not depend upon the fluctuations of human agencies nor on conditions where relations to results were uncertain, but upon the immetable working of natural laws, and upon the



SPEED OF AN AUTOMOBILE SHOW COMSECUTIVE PROTOGRAPHS

evidence the presiding judge may well have found that am h experiments were likely to be more reliable as to the speed of the automobile than the conjectural statement of an eye witness or the interested states

Racetácial Complianeate Faist to New Buildings in A superstition that still arvelope a great part of the searth as that envisors a great part of the searth as that envisors are produced to the search as that envisors are produced in the search principaling a living creature, preferably a h-sman being, in one of the walls of the building that the hand being, in one of the walls of the building that the This build, which is particularly prevalent in the Raikkan penimula and, for instance, has given to the Councaina Queen, Carmon Sirvi, Raikerial for one of her most beautiful folk takes, has not been known as being had any hold in Tally thicker's Recently, in the course of archeological research, it was found that in the foundation of the Temple of Fortune in Pompell in the foundation of the Tempie of Fevirus in Penguid there was a hollow space in which nothing other than the the thin the space of the thin the space of the thin the space of the space of the space of the precise immurement of a forticle, which was exhaused by the disposition of the square blocks of stone of the creature's prison. In Test this superetition may have penced at an early day into oblivion, as the smedder of human beings was foreign to the Roman religions of human beings was foreign to the Roman religions and was precised occasionably only made Ornels. In all was precisioned consinuation and year made for the answar precision occasionable of the space of the space of the nameng the old Greeke was not remand, high in decrease, as well as in the adjacent countries the windiction of specifics to now buildings is still instanted, it may be

believed that in old Greece also the sacrificial comnestored task in old utreece also the sacrificial com-plinent to new buildings was not unknown Instances of this kind of sacrifice in antiquity are certainly not frequent, all those of which we have any knowledge are attributed to the Greek Orient Usussity a mattern was sacrificed who, at the same time, became the guardian apirit of the structure. For this reason Trajan effected scorinced who, at the same time, became the grandina appried the structure. For this reason Trujus effected the girl who has been scriftled on the occasion of the reconstruction of the city after an arrhbquish and was designated as Tyche, the Goldess of Fortuse of the season of the sametifice. It is this fields which still lies to-day at the root of this superstition of ascribed compliment. Solidly a human being is incased in a wait of a besser of the motion, which the continue the same time of the same time of the same time. The same time of a such immediation. The human scriftles have the place of such immediation. The human scriftles have the place of such immediation. The human scriftles have the place of such immediation. The human scriftles have the place of such immediation. The human scriftles have the place of a person, or of the shadow, and immerring the string representing the measure or by leasing in the wait as assumed already killed or still alive. Manifestly petition complete the properties at the human scriftles are the preparation of the human scriftles are the place of person, and probably the tortices was scientised because this animal can live a long time without new indeer effective the longer the entombed creature lived.

When death is caused by hanging what propor-tion does the pull to which the rope is subjected dur-ing the struggles of the victim bur to the weight of the body? This novel question has been asked and answered by experiment by Dr. Angelo de Dominicis. answered by experiment by Dr Angelo do Dominicke. The testation is used: case was measured by a dynamo-meter attached to the rope. A living dog, suspended in such a manner that it remained quiet exerted a pull of 20 pounds, but the subsequent "hanging of the same azimal produced a puil of 42 pounds. With a larger animal the corresponding tensions were 50 pounds and 103 pounds.

Hence it appears that the convulsive movement Hence it appears that the convulsive movements of the victim may increase the tension of the rope to more than twice the weight of the body. This result explains the occurrence in the bodies of persons killed by hanging of serious lesions which it would be dif by hanging of serious testons which it would be dif-ficult or impossible to produce by hanging up a corpse. The strength of the rope must also be taken into account. If a body is found suspected by a rope the hreaking strongth of which is little greater than the weight of the corpse, it may fairly be informed that the body was not suspended until after death Hence the experiments turnish valuable data for determining the cause of death in such cases and will puthably be made use of in some future detective story.

JUPITER AND HIS SATELLATE

BY PROF. FREDERIC R. HONEY, TRINITY COLLEGE

Jupiter and his satellites commu Jupier and his satellites command expectal atten-tion at the present time, owing to the fart that this greatest of all the planets and second only to Venus in brilliancy, is approaching opposition which will be reached on March 30th Jupiter will then be

be reached on March 30th Jupiler will then be both morning and ovening stars.

The comparatively recent increase in the number of Jupiler's eachiltee from four to seven and pos-sibly eight as revealed by the growing power of the triescope directs the astronomer curl one scrutin upon the Jovian gratem. The

one screen upon the Jovian system. The suitilities which is nearest the planet revolves around its great primary in the short space of twelve hours, at a distance of only 68,000 miles from the surface, while the outer most moon shows its outreme remotes from its center of attraction (the enormous distance of 7.35,000 miles). distance of 7 430 000 miles) by a revolu Hon requiring 265 days. Thus is exempli-

fied a perfect conformity to Kepler's naw.

A small magnifying power reveals the alliptic
ouiline of Jupiler, whose polar depression is ex
reus by marked the equatorial and polar diameters showing a difference of over 5000 miles

in the plot of the orbit Jupiter's position is shown for the date of opposition, which is very near sphelion, also for the oppositions from 1802 near sphelion, also for the oppositions from 1802 to 1911 inclusive The average interval between oppositions is 399 days. But, in obscilence to Keylars ascopid inw. the planets velocity at aphelion is distributed by the court of the court tions, which occurred before and after the hollon passage were respectively September 11th, 1903, and October 18th, 1904

The five inner satellites revolve in orbits whose planes very nearly coincide with that of Jupiters squalor. This plane forms a small angle with the eclipite, and may be represented approximately by a straight line (Fig 1) The distances from Jupiter to the satellites are represented by the same scale as the planet. It is impossible to show the positions of the two outer satellites by this scale within the limits of this page, since their distances from Jupiter

or this page, since their distances from Jupiter are over all times that between the plant and Califate. It should be noted that all the satellites are nearegen the same side of the planet at the same time, as shown in the flaguer This view of the satellites are nearly strong the satellites or believe the satellites or believe the satellites or believe the satellites or believe the satellites of the plant of the order of the order of the order of the order of the satellites of the satellites of the satellites, and at every revolution of each satellite there is alternately at runnal across pupilers alternately a transit across Jupiters disk and an occultation by the planst Fig 1 shows Jupiter and the orbits as seen from the earth in 1908 in 1902 this figure was re-versed During Jupiter's revolution versea During Jupiters revolution around the sun in 1186 years, the planet and the satellites are continually changing their positions relative to the ecliptic The plane of the orbit is inclined at an angle of 13 deg , and that part which is above the ecliptic is represented by the full line The line joining the points N and N' (the as descending nodes) is the intersec-tion of the plane of the planet s orbit with that of the ecliptic In Plot 1 a visual ray A from the earth tau-

gent to the planet shows that, seen in this direction, Callisto is no longer occult od by Jupiler Between the positions A and C, and between B and D, the orbits very gradually open out to the elliptic form, and at C and D

open out to the citiytic form, and at C and D the length of the minor rais reaches its maximum Fig 2 represents the orbit of Callitic when the matching to longer suffers occulation by Jupiter Committee of occulations of occulations evidently begins some time mum width. But the diameters of the ordits of the four inner satellites are smaller, and with them transits and conductations continue. There will be no occultation or transit of Callitate or its shadow this year after January 55th. On this day the shadow was projected on Jupiter between 5 h 1tm and 1g. 5 m. In the point of the orbits of Jupiter and of

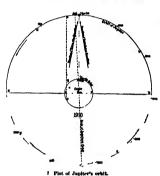
the satellites the general directions of the lines of vision from the earth before and after opposition are indicated by arrows.

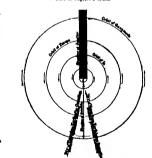
Obviously the planet does not occupy the same

continuity the phase need not comp the before and after opposition. But if this page be related elockwise and counter clockwise through small angles, one posttion will represent Jupiter in his orbit before, and the other that after opposition Before opposi-



Relative positions of Callisto, Jupiter and the Earth.





11. Plot of Juniter's orbit and of his autolities' arbits. JUPITER AND WIS SATELLIPES.

tion it is clear that the transit of the estellite's tion it is reserved that of the matellite, and after opposition the satellite procedes that of the matellite, and after opposition the satellite procedes the shadow For example: (saymed's shadow crossed "upptiers" disk on January 7th between the hours of 14 h 44 m, and 17 h. 51 m. (W M T). The shadow was clear of the planet before the transit of the satellite commenced placet before the transit of the matellite commenced to boars and twenty minutes later On June 28th line same ancellite will cross Jupiter's dick between the boars is bit on and it is, \$\foatstar{\text{T}}\$ m; and the shedow will follow 3 hours and 37 minutes later Whee a smittlife passes into the anhedror of its grimmer, it is described as "scilpent." The dates of the transition of the maintline and their; shadows, and of the colpses and occultations, and given in the Nantical Ammante for the mostila. For each uncertainty of the colpses and occultations, and given in the Nantical Ammante for the mostila. For each uncertainty of the property of t

after conjunction (Ootober 18th) when Jupitary praximity to the sam will be too close for cherwatten, the phenomens of the statilities are unitied. Observations of the continties are united. Observations of the continties of Jupitary ambilities provide a valuable means for vertiputs the valuable means for vertiputs are reposition, an occultation is observed to securater a longer interval of time than that which would calculate the provided properties of the provided provided by constant distance, and after conjunction, when the earth is approaching juritar, the interval of the certain orbit in a sittle less than a thousand are observed to diminish Light crosses the earth's orbit in a sittle less than a thousand 110,580,0000

seconds . == 16 m. 87 s. At the

184,230 date of opposition this year Jupiter's dis-tance from the earth is 413.5 million miles. Occultation of a satellite at this distance

is observed on the earth

× 997 seconds

of

A year seconds.

A comparison of the sarth and moss with Jupiters satellite system is shown in Figs. 1 and 2, which are drawn to the same scale. The moss's distance from the earth does not differ very much from 10s' distance were reduced to correspond with that distance were reduced to correspond with that distance were reduced to correspond with that satisfies were reduced to correspond with that is distance to control the sate of the planet's assistitute would be seen sharing the sate of the planet's assistitute maintaines them in their orbits in coposition to the great central from 2 strictling them to Jupiter, whose mass is 11s times the planet's satellite maintaines the times of the satellite from 10s' distance of the 10s' d

JUPITER'S SATELLITES.

Наше	Distance, Miles,	Period, Days.	Dismotor,	
V Io Horrps tianymede. (hillisto. VI	119.800 961,600 418,600 6=4,000 7,196,600 7,406,600	0 5 1 77 7 15 16 60 60 4		

That the controlling device That the controlling devices for a single-phase or equipment and not be more complicated than for a direct-current car, retases the Sheetz-current World, will be apparent at once the single-phase of car can be applied immediately to the former without alleration. It is existent that it is a single-phase to reading a sufficient to the single-phase that the single-phase they equally as satisfactority as to those of the direct-current type as the single-phase they equally as satisfactority as to those of the direct-current type.

as satisfactority as to taces or use directoursait specific and Morrorer, with the alternating-current equipment it is possible to substitute reactance cells for the resistance of the rhecetax, and thereby eliminate a considerable portion of the energy dissipated as heat in the emitted circuits during socieration. In addition, with the portion of the energy dissipated as heat in the outcome circuits during acceleration. In addition, with the shape-phase car there can be obtained, conveniently any desired number of voltages to be jumpissed upon the motor circuits, and there is thus no insensity pu-tal matter of the property of the property of the familiar the E. M.F. to a staple value, for this late of the convenience of the property of the property of the matter of the property of the property of the convenience of the property of the property of the convenience of the property of the property of the convenience of the property of the property of the property of the convenience of the property of the property of the property of the convenience of the property of the prop

A REMARKABLE PERSONNESS.

Fig. the Billion of the Summerous Assuments.

The has been desired the management of the Summerous Assuments of the "remarkable phenomenon" in the summer of t communes my sur. V. J. Laints, in which a rainbow was sepan to be disturbed after each peal of thunder. Mr. Lefswar explanation, based upon the change of size of the rain-frequ, is apparently unwarranted, insamuch as according to the old and generally accepted optical theory of the rainbow, the angular position of the voters of the how relative to the direction of the sun

and the observ the rain-drops, rver's eye, is independent of the size of

the rain-drops.
To the writer the phenomenon is more plausibly explained by recognizing the atmospheric disturbance in the lits of sight of the observed case the tenderbolt. The light, after dispersion by and reflection from the rain-drops, passes through all which is agitated by the occusions following the lightning stroke, and the interpas count waves radiating therefrom The result diar to that seen over a hot surface, as a stove or heated field, where the convection currents dist

or heated field, where the convection correctle distort the light rays averening the corryling air.

While it is true that ordinary sound waves do not affect the density of the air audicently to deviate the course of light perceptibly, the violent expansion and contraction accompanying a thunderbolt may produce the result. The peculiar circumstance in the sear referred to it take the atoms approached from the east, opposite to the sun, so that the tightning discarges, which are generally in the advance portion of the atoms cloud, cocurred in the violent portion of the reliable, whereas ordinary or the search portion of the reliable, whereas ordinary on the product of the reliable, whereas ordinary on his passed over and the lightning is taking place in the distance beyond.

W. H. Howano, Washington, D. C.

THAT OURIOUS WATER PHRHOMEROF.

To the Editor of the SCHRTIFIC AMERICAN
I observed a similar curious phonomenon to that ted by James S. Lee in your issue of January reported by Jamus B. Lee in your issue or January 29th Mine was observed from a train going west through the great Alkali Desert in Newada. The desert floor is of sand, and flat, as though laid by desert foor is of and, and fist, as though laid by water I nountemble desert or back grass mounds overed perhaps ten per cent of all the surface. These mounds or dense vary from six to twenty foot in diam-eter by one to two foot high It was about five o clock of a warm September afternoon I motiond, looking westward and nearby, what seemed to be a small but powerful stream of

water or fountain, going to perhaps twenty-five feet in height. Close observation revealed many hun-dreds of those fountains. As near as I could make dress of these foundains. As near as I could make out, there was one from the centre of each of the and dunes, varying it size much as the sand dunes varying it size much as the sand dunes warlet processes of the countain were really formed by cipient cycloses currying sand, not water, in small streams, somewhat in the shape of elender long-waisted bourglasses, spreading at the top to fail to earth. These varied from twenty to fifty feel the fact, the continued of the continued to the continued to the continued for ten miles along the time.

The continued for ten miles along the time of the continued to the con them? I suppose the floor of the desert was several degrees cooler than the and dense, which had been absorbing solar heat rapidly all day As evenies; approached, the warmer air over the dense rese-rapidly, assuming the natural spiral metion, licked by warm dry sand, and made a most beautiful pic-ture. The passengers gased and wenderd "why. Will the Editor please give the cerrect cause if mins, as given, is theoreted?

ROY T KIMBATA San Francisco, Cal.

WANTED: AN ELECTRICAL APPARATOR FOR LOCATING

TO the Editor of the Scientist America

to use minior or the SCHWIFT AREBOAN

I have been unsuccessful in finding to England any
manufacturer of an improvement upon the underwater electrical novelanding apparatus originally described in the SCHWIFT OF YOUR Paper dated Japsery Soth, 1904.

serviced in the sproparameter of your present con-party such, 1950.

I and histonype to boosis the nonition of the just of I and histonype to boosis the long by of sect beam, which has no hourd fury-form cannon can be consider-sive specifity of manon hall, suggregating appreciates; the consists a number of solver and compare coince. The health of observed by about the bloodly such can suspice to compain a number of solver part and compare coince. The health of observed by about the bloodly such can excipted the fair in about 19 they of weight, the a excipted pro-table of the large of weight, the a excipted pro-tachment has They institute to boosing the which a pro-ling pleasured considerable in boosing the con-traction of the consistency of the contraction of the con-traction of the consistency of the con-traction of the contraction of the contraction of the sandonical descripted in your Servicestory of the sub-tractions of the contraction of the contraction of the con-traction of the contraction of the contraction of the con-traction of the contraction of the contraction of the con-traction of the contraction of the contraction of the con-traction of the contraction of the contraction of the con-traction of the contraction of the contraction of the con-traction of the contraction of the contraction of the con-traction of the contraction of the contraction of the con-

Scientific American

of the apparatus, to show that it could fulfill the work-ing conditions necessary I would also like to know the cost of the instrument.

KERRETH MACKERESE FORS, Lieutenant Colonel London, S. W

The Wisps of Satura.

In a recent bulletin, Prof Percival Lovell of Flagstaff, Arts, annouese that on September 19th, 1909,
in examining Satura he noticed what seamed to be
faint lacings travering disgonality the planet's equatorial belt Not only was the phenomenon unpreforfal hel? Not only was the phenomenon unpre-cedented, but it was to faint and illusive the twas unable at first to assure himself of its objective reality. On mentioning his impressions to his assist-ant, Mr. E. C. Slipher, he found to his surprise that he had had expected on the same thing on Septimes fith, and had even thought to detect traces of it on the photographs of Shiturn taken by him aftered on that day At the same time that Lowell divisand rather than described the wine he saw unmission that the same time that the same time that the same than the same time that Lowell divisand rather than described the wine he saw unmission that thought the same time that Lowell divisand the same time that Lowell divisand the same time that the same time that the same time that the same time that Lowell divisand that the same time that Lowell divisand to the same time that the same time time that the same through the middle of the bright equatorial belt, a line not of uniform character, but as if composed of

ine not of uniform character, but as if composed of code strung upon a wire. Following up the eye-high show vouchanted he exam-ned the equatorial best for the wispe at moments of good definition during the succeeding days. Re-eated observation of them, both by him and his aspeated observation of them, both by nim and his as-sistant, eventually showed them to be facts, and then, to clinch the matter, he succeeded in getting, on No-vamber 4th, some screlient photographs of the planet in which they stood recorded, appearing is situ in suc-

is which they stood recorded, appearing its affet in successive images on the same pital.

The manner in which the photographs are taken enables ones to ellimate on the lunges imperfections due the appearatus from features due the planet of the support of the s

On the photographic plate in images suppose cast upa they do to the eye, though of course not so well
defined, to wit as wisps or filaments, fainter that
the dark being or the pinner's disk, creasing the burst
equatorial beit. Like all astronomic phenomena pretously unpervedued, they became much causer to each
after their presence was known, their recognition
to being nearly so diffur its at their discovery. Their
apparent lack of contrast with their surroundings its
reason of the contrast with their surroundings to
the contrast with their surroundings. It
is note that the contrast with their surroundings to
the supervise of the contrast with their surroundings.

In look the isenings resemble faint abreds of some
dusty substance in the act of dropping from points
on one often of the bright beit over to the other
Though darker than the bright beit over to the other

on one onto or use origin per over to the other Though darker than the bright belt, they are much lighter than the dark beits from which they come a illiference in tone which is probably due to their real sendercees being spread out by the light waves and so thinned in atrength.

o training in strength.

Careful scrutiny revealed that the wisps started com triangular spots in the dark belt, and Mr G R from trinarular spots in the dark belt, and Mr G R Agasia, who was observing with Pref. Lowel, detected that the adjacent parts of this belt were themselves crisscrossed by durker lines. The trinarular sizes are not difficult giving the edge of the belt in noot been possible as yet to use the wips for timing the rotation periods of Saturn's equatorial region, soon chiefly to their number and the confusion consequent upon R, but identification will undoubsidely con-tinues and give us a more accurate value of the equa-torial asset that New set present powers.

time and give us a more accurate value of the equatorial agend that was ob present possess.
Indirectable as the landings are in themselves, they should deeply of form the Fact, that they almost proceeding yields the phonometes received the convenience of the proceeding of the process of the

than the wigon. The Schurdan isology cross the equatorial belt panelly of an angie, but one which he less than that of the strengs of the Jerna nose. This angie about have something to my about the factors concerned in the foreign the control of the two sets respectively; for analogy he best explained by secondary difference.

Official Metaerological fema gical Summary, New York, N. Y., Pobrusry, 1910.

pubruary, 1916.

Atthougheric pressure Righest, So.71, lowest, 264; mean, 261 Temperature Righest, St. date, 28th, lowest, 5, date, 7th, mean of warmest day, 4th, 54th, 54th, content day, 1th, and 1th, mean of maximum for the mosth, 27th, mean of minimum, 50r the mosth, 27th, mean of minimum, 51th, 10th, 25th, 25th,

temperature of Pebruary, 40, in 1890; coldest mean, 12, in 1875-1885 Aboutto maximum and minimum of Pebruary for 40 years, 69 and — 6 Average daily excess almos January 1st, 14 Precipitation 407, greatest, 187, date, 25th, average for February for 40 years, 2,30 Accumulated excess sincy January 1st, Greatest precipitation, 7.81, in 1893 least, 0.82, 895 Wind Prevailing direction, West, total movement, 9,679 miles, average bourly velocity, 144, movement, \$479 miles, average bourly velocity, 144, maximum velocity, 46 miles per hour Wester Clear days, 8, party cloudy, 10, cloudy, 10, on which 601 or more of precipitation occurred, 9 Snowfail 53 Mean relative humidity, 65: 8 less, 9th, 12th, Dones for Site. Mean temperature for the winter, 3172, normal, 3180, deficiency, 007 Precipitation for the winter 148, normal, 1108 Excess, 365 Total snowfail for the winter, 33.73.

Ephomeric of Comet A 1910, Rhhomeria of Cemet A 1916, A lotter has been received at Harvard from Capt. T. E. De Witt Voeder, Buperintendent U S Naval Observatory, giving the following elliptic elements and sphameris of Comet A 1910, computed by Prof. H. H.

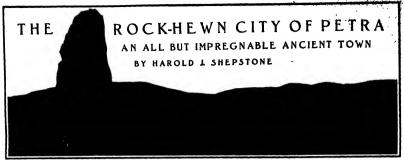
Morgan
"Numerous direct solutions having failed, the
"distances for Washington observations Jatuary 25th
and February 4th were varied to get the following
telements. A slight change in the elements carries the net near Mercury January 19th, and near Mars last

The Current Supplement,

A new process for reducing sunespheric nitrogen, invented by Dr Schonherr is described in the opening article of the current Supplement No 1784 Among article of the currout Street services on ATM. Among the present wombers of science none after the Uningia atton no powerfully as the dot trine that some forms of insantity are the result of a chemical change in the blood. The theory is enhoratly discussed in an article entitled. "The Chemistry of insantity" The recent development of acconsuites an audieval present of a domand for targe quantities of hydrogen at a tow price. The subject is considered in a short article to the considered in a short article product of the considered in a short article product of the considered in a short article product of the considered in the considered in a short article product of the considered in the montal bombardment of the "Belle 1880" of the Perissis may, no sur thorough and systematic firing tests have been directed against a warship in any foreign may as those of which the French warship "Jena" was the subject last year. An elaborate article by a competent authority gives the results of the testa. completes authority give the results of the teats.

W P Dreaper characteristy reviews the artificial silk industry. One of the most recent important events in the field of prohibitoric archivology was the discovery of a megalible monument of remarkable site by Biscopile Italy. This subject is discussed in an illustrated article in the middle ages faircory, or have less apart of kings. The origin and development of the process of the proc ing, was reparded as the king of sports, as it was the sport of kings. The origin and development of his obsolete forms of hunting in discussed by IP. Flans Bollium: In an article outlied "Nahoury in the Middle Ages". Purhase the most distinguished authority on the subject of processors stones in Germany is Prox M Basser of Marbury, its contributes an exhausting article on article in the contributes an exhausting article on article in the contributes an exhausting producing should be approximately an expectation of directly producing also monits from cube-over gas in described below Dave, nearly a century and, constructed the Since Davy, nearly a century ago, constructed the first safety lamp, inventors almost innumerable have first safety lami, investors atmost innumerable helve produced lamps barring their names but in the fia-jority of instances the allested improvements have been more apparent then real A comparative esti-mate of the safety of these various forms of interest impacts presented by i B Marsatt F W Heekel contributes an arithe on astronomy and survivory. In which in riddius the purposed influence of the planets pon human affaire

After three successful flights on March 2nd, Lieut. B. D. Foulois in a Wright aeroplane, made a fourth attempt at San Attonie which resulted disastrously The rudder of the machine was wrecked and Lieut Poulois had a narrow escape from injury The ma field at Fort Sam Houston when the engine



The rock-hown obeliaks of Petra.

aview is taken hugo up to the south of the narrow villay called the Waly Mona (the Vale of Mona) in which the fam desert titles. It is on what tears the name of the Monatain of Obsidais, so called from the huge monabilit pillars that Thut highly take his judged by comparison with the gigar of a Belonia standing by one of them. Their are within ue rock-est city of Petra reposed in ancient times, securely shut in from stiack of the m have been made with incredible soil by cutility away from all around them the recursive for rotate in that recognition and design, as also are many of the prices and temptes of i alled from the huge monolith pillars that have been used ing by one of them. They are evidently Egyption in th

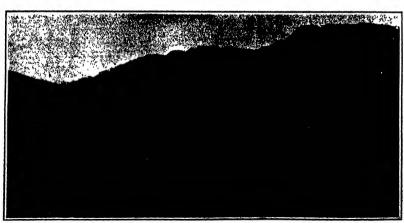
Unique among the many wonders of the Orient and the remains of heary civilizations stands Peter the case heave in Part 1990. The case heave in Part 1990, the Case heave he

which they still form a part. These rules iff rains they may be salled) that leans admiration by the variety of styles they embody, showing, in the most anchal resultine early native art intermixed with Egyptian and in the later magalifacter defines the best types of Greek and Roman architecture, and by the exquisits howe of the monatone from which they were hewn, varying from his prevailing purplish red of the mountains and offits to the desicate pink and rose color of some strata, and the white crimson yellow and therein bound voins in other packer, trianing the extinces of

the plumage of birds or the petals of flowars Petra, so long inaccessible because of its remote-ness and the danger from roving Bedouins, may now be reached by a six hours' ride westward toward tha be reached by a six hours' ride westward (oward that Arthah from El Man, a station on the now Merca ratiroad Prof Gustaf Daiman, director of the German Archeological School of Jerusalism and the suthor of a monumental work on Petra, has just paid another visit to this evene of his former applorations, in which he was accompanied by photographers of the Ameri-yan of the Companies of the Companies of the Ameri-photographs of these materials rains, some of the most striking of which we here reproduces for our readors.

readers Petra neetling amid its precipiers and citiffs atmost in the shadow of Moust Hor, reliefs by the natives Jabel Harun (Aaron) from the tradition that it was here on the top of the mount that Aaron died, is spruna hable only trom the east through a deep an arrow delie which the little stream of the Wany Muss has in past ages ut to ritest in the red and atons. The gorge opera to one place to about two mittes in width for a datance of about a mile, and mites in width for a distance of about a mile, and here, protected by mountains and precipiese on every ride, this remarkable town lay secure from attack from without it was its impremable position and its being on the great caravan route to the Red Sea from the north that gave it the importance it bad as

a trade depot and stopping place. The approach was beenest a grand arrived portal at the mouth of the best of the portal being still visible. It have half an hour to follow the windings of the narrow path along the ark ravine, which is only from 10 to 20 free wide, breading the course of the oleander friends stream do until one course into the annual conv. waitor The bed until one energy into the small open valley. The straignted seadsone rocks rise precipitately on either side to the height of from 100 to 165 feet, almost about ting out the light of day. One of our views shows the extrance to the 8th Another is taken about twenty minutes in from the opening, string a good idea of the narrowness of the defile and the precipitonsure of the rock walls, while beyond, where the spore widens a little, are seen his evulptured columns of the magnificent so-called Khazatte el Faricon (the Treasury of Pharach) although it is one of the theory of the contract of the contract of the place in A.D. 121 and errated here a tought to place the contract of the contract of the con-arrowing, which is justly regarded as one of the won dere of the East. The rock wall from which it is structure, while is justly regarded as one of the won down of the East. The rock wall from which it is hown is here an exquisite rose pink. It is in a state of remarkable preservation. The imposing façade abows two rows each of six majestic rotumns one row above the other, with niches in which are rock-



fife, or death, in pearly two miles long. Correct with matchines shift, after the penneption of companyouter mank; probability the besteloo of the stream, the purchas here of the numbers, the trivening disht. the impossible version, the brillians atmosphere, and the fragment of bless play short, the first paided unique.





The theater among the rock-out rains of Petra,

Ed Ber, one of the most remarkable of the temples and tombs of Petra.

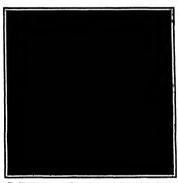
hewn equestrian and other statues the whole terminating above in a miniature temple crowned by a huge urn, the eatire height being about 65 feet. Within is a

beight being about 65 feet. Within is awar lefty room and some chambers.
A short distance beyond one smerges into the mountain guarder valley in which the city lay, mounds of slebris marking the sites of the former bomes of the Petrans, the population in the city's paining days being settinated at from forty to eighty thousand souts. The rock hown structures chickled in the precipitous cliffs on every sides were public buildings and tombs rather than dwellings. Just on and tombs rather than dwellings Just on the left, as the valley is entered in the west rock-cut theater in semicircular form. wast rook-cut theater in semicircular form, causable of holding 3000 spectators. Here are the workmanship is Greek. There are thirty-three there of seats in this locality are some of the oldest tombs, including detached prions Many of the oldest tombs were rut away when the theater was been out of the mountain side. One of our photographs is of the theater.

Standing in this small ones walley one of the standard of the standar

photographs is of the theater

Standing in this small open valley one
sees the facedes of tombs and temples of
any styles and dimensions with many
niches for voltwo offerings. They are at
all elevations, many low down on the
mountain side, and others high up in the
atternative statement of the property of the control of cliffs, with etairways cut in the rock to



The Sik, the extrance to Petra, the imprognable rock-hown city of antiquity.

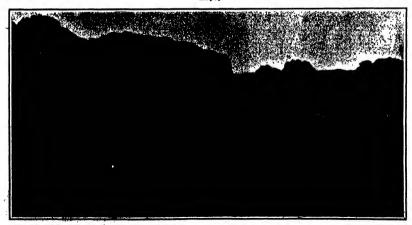
reach them While most of them stand out nepicuously others are hidden in the ountain recesses and interal valieys mountain recesses and lateral valleys How eloquent are these silent prions and obelisks of Edom and Egypt, and these columns and capitais of forece and Rome! What diverse peoples these tombs have looked down upon when living and given sepulture to when dead! And how many looked down upon when living and given sepulture to when dead. And how many different religions have been represented by ministering pricats at these shrines! One of our photographs is of a tomb or tample in three stories (ut out of the

mountain wall on the cast and showing a succession of similar buildings beyond The façade of this tomb is not like most of the others in imitation of a temple, but of a lordly palace and it has been consid erably damaged

erany damaged
On the opposite side of the valley to the
west stand the remains of a masoury odifice called by the natives Kaer Parfoun
(the Castie of Pharaoh), of which we also
give a photograph it was a Roman
heathen temple

heather temple

Behind the Kasr Parloun a rock-cut
staircase leads up the rugged hill of the
Acropolis to the Place of Sacrifice with its arropoint to the rince of Sacrince with its altars, pool, and court, all hewn out of the living rock. This was a typical holy place, or "high place," of the primitive (Concluded on page 427)



mining the rates of entiretty. Control the obspacetion walks of reals which excises a still mark how such Etemet, but an industry of Rubers, has adjusted the wincing the walks with all the heaties of epithetene and are—with integer, heads, and pales.

sements present Neture is her wildest and most savage forms, and six of your soul will be the memories of this silent, benutife! "resected

AN ELECTRICAL FEVER RECORDE

BY DR ALFRED GRADENWITZ

Fevor, i.e., the rise in blood temperature attending certain maladies is known to be the outcome of a spontaneous reaction on the part of the body against the microbes invading 11. The opinion is therefore, erroneous that fever in all cases should be acted against in order thus in subdue the morbid state of the patient. Nevertheless it is of the highest import-ance that the physician be kept informed of the variable temperature of the blood

According to present practice tempora-ture readings are taken at regular intervals, say three or four times a day by a sensi-tive thermometer. This practice obviously gives no information as to those oscillations Lives no information as to those oscillations in temperature which may have occurred in the meantime and which, in some cases, it would be desirable to know A process allowing this important factor to be recorded continually and automate ally therehem of Herlin constructors, Mesers Siemens Halske, have recently perfected an ap-

a tained, nac result perfected an ap-part the achieving this result. The apparatus is based on a very simple principle via the alteration in the elec-trical resistance of platform wire by variations in isomerature. It comprises in addition to a coll of platinum wire a Wheatstone bridge and a self record ing millivoltmeter

r militoritancer
The pintinum coli is either introduced into some The pintinum cold is either introduced into some of the earline of the body or fixed on the body. A couble conductor of low resistance connects the coll with the bridge and millivoitmeter, which execute any variations in the resistance of the platinum

any variations to the resistance of the platinum vites and accordingly the temperature of the body. The surrent required to feed the apparatus is sup-posed to the control of the control of the con-relation of the carries and the control of the con-sistance with cearse and fine adjustment. As the normal range of the recording apparatus comprises the interval to

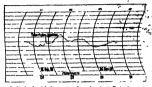
the interval be-tween 10 dog and 45 deg C the curves registered are of sufficient are of sufficient distinctness for any therapoutical and solentific purpose The electrical

fevor rocorder is constructed in two different ispen in the first

type, the rotating voltaneter is sus-pended from a stric of metal, the curve being recorded on a paper tape about 45 meters in in meters in iength which is newed along by a clockwork at a speed of 20 millimeters per hour of the tape is 120 mtillmeters low the paper tape there moves under the action of a clockwork an luking rib-bon, over which er carrying at its end a runner The position of the pointer in each minute The series of points

forms a distinct curve The clockwork should be wound up once a week, a new paper roll being inserted every three

The second type conturises a relary roll located The second type contrises a rolary roll located between points, so that the apparatus is insensitive to any moderate oscillations widle not requiring accurate horizontal adjustment—the registering tapo is wound together with a sheet of carbon paper round a drum. As in the former apparatus, a style marks time. The apparatus is designed either for a rotation of the drum (about 360 millimeters in periphery) in about 7 days or in 24 hours. The paper tape and carbon should be exchanged after each turn, which



Record obtained with fever recorder, showing effect of

in accordance with the rotation speed of the drum. in accordance with the rotation speed of the druin, and takes place either every 12 or every 2 minutes in order to atlow for both speeds, the apparatus can be fitted with two drums, exchanged against each other by a simple manipulation. The useful width of the super tupe in this case is about 80 millimeters 1 e, somewhat ioses than it connection with the former type. This is why the one is generally used for accurate, adentific investigations and the latter for ordinary clinical apparatus.

The United States Hydrographic Bureau and Coast Survey has charts of the Great Lakes and the Atlan fit, and Pacific, coasts which are consulted eagerly by

time and sult water capital derivatives are lader with over at gen but not so generally prised by the spelter. On the Great Lakes alone positions of wrocks are charted w positions of wrecks are charted which con-tain many millions of collars in buildies and ore. There is no vigue smoortshirty about these treasures. They were known to cents in the holds of the ships, and no man has yet been sale to recover them. The steamer "Pewahle," for Instance, which went down in Lake Huron in a storm in went down in Lake Huron in a storm in 1985 carried with her haif a million dol-lars worth of copper from the Lake Super-lor mines For three decades expeditions sought to find the wreck, and finally it was

iocated about six miles southeast of Thunder Bay. But the wreck was in such deep water that only a very small fraction of her cargo was ever recovered Here is a submarine copper mine which might tempt

the most adventurous soul to risk his life in gaining.
The chart of wrecks on the Great Lakes compiled
by the Hydrographic Bureau and Coast Survey shows ly the Hydrographic Bureau and Coast Survey shows the relative depth of water and this simple record ris the whole story of why outerprising man has not been able to receiver them. Divers seeking treasures in surken vessels have learned that anything which lies much more than 100 feet deep is very difficult, if olutely impos to recover The pressure of the water beyond that depth becomes so great that diving suits are upt to collapse and crush the wearer We know from a study of the charts that hundreds

of ships leaded with tressures have sunk in wa ter ranging from 100 to 250 feet in depth and if div ing suits could be invented to withstand the ener sure at the lowest depth and enable the diver to work easily, tunes could be quickly made The whole his-

of tree hunting under the water has been marked by man's futile ef-fort to fight against the pres-ture at great depths. One hundred feet below i, the pres divine



AN ELECTRICAL DEVICE WHICE RECORDS A PATTEUPS TEMPERATURE FOR EVERY MINUTE OF THE DAY AND MIGHT.

a large class of adventurers had herd, practical men of business and science, who are interested in the recovery of lost wealth through improved satchods of deep-eas diving and wrecking. These charts are simple and unimpressive in appearance, shd might easily be mintaken for ordinary coast charts with here said there dots to represent submerged reefs or rocks, but

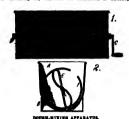
100-foot mark. For Instalmen, where the "sistems" "Pewalthe" was located in Lake Harren, a child the Toledo, Chicarrent, every to teared; it, and was been considered to the construction of the construction

Schoolific American

ha talk Department

BOTTOM-MIXING APPARATUS

Pictured in the accompanying sugraving is a de-vice adapted more particularly for kneeding dough, but which is also applicable for mixing, stirring, or dauraing any material for household or cultuary



purposes. The machine comprises an approximately rectangular receptacing of formed, however, with a sea apport for the recupical. The end while of this mixing machine are provided with journal bearings, in one of which a creat handle of is supported to a creat handle of a support for the creat which a creat handle of the support of the control one and of a spirally curved silters blade in The opposite end of the alters blade in format case to the support of the suppo stirrer stade and urraing the crank in a reverse cir-rection, the latter will be unscrewed from the hub so that both the crank and the sitrrer biade may be re-moved from the receptacle. A patent on this mixing mechanism has been granted to Mr Sanner E. Ray of

IMPROVED STEP LABOUR.

INTRACTUS STEP LANDER.

In the SCOLUTER ATERIAN OF November 14th, 1908, we published a description of a collapsible step lader An improvement upon this form of ladder has recently been patented, which is provided with an upper section that may be reasonable in the lander of the lander is only and the lander of the lander of the lander of the lander is only and the lander is only of the lander are binned to one of the side-rule as shown in Fig. 3, while at the opposite side they are provided

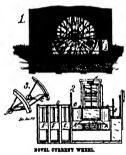


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with brackets D, in which are slots adapted gage hinge pins secured in the side-rails A. slot and pin commection provides the necessar when the ladder is collapsed. The pins on wh ed to esor play when the ladder is collapsed. The pins on which the steps are hinged its at right angles to the rails A, and in order that the trust surface may be horisontal, the steps are made of a substantially wedge shape, as indicated in the illustrations. The top or platform if of the ladder is also hinged to the rails at the He of the ledder is the hinged to the rulls at the points FF, which list on an area at right angles to the rails B. To support the ladder in its normal isolated positions, two legs G are provided The legs are connected by the usual links H to the rails A, and at the upper ends they have attension pieces that shorton the indexr, these extension pieces with the upper rails B are withdrawn from their sockets. Then a top piece, such as indicated in Fig. 2, is applied to the ladder, the four about logs of this probability is sufficiently and the service of the rails A. The last G are withdrawn and hast to the rails and also through the logs of this provides and also through the logs of the rails and also through the logs of the rails and also through the logs of the rails and also through the logs of the ray are reand also through the legs of the top piece. In your want the logs of from proceeding too far they are re-tained by means of brace bars K. The links H in this case are unnecessary and are folded upon them selves, as indicated in Fig. 2. Mr. William J. Diru-dell Box 182, Brooklyn, N. Y, is the inventor of this improved size ladder.

MOVEL CURRENT WHEEL.

A number of advantages are claimed for the wheel illustrated herewith namely that it does not require the use of dans, it regulates itself to the rise quire the use of canal, it regulates tests to the street, and fall of the street, use only the surface current, is equipped with reathering blades, and is provided with means for preventing the parts from freezing fast in cold weather The water wheel is supported on pontoons, as indicated at A in the illustration.



The postcons are connected by means of links or parallel arms B to a fixed framswork supported on plies driven into the bed of the stream. Fig 3 shows the construction of the biades used on the wheel The spokes of the wheel are arranged in two parallel sols which are bifurcated at their outer ends. The blades which are bitureated at their outer onds. The blates of are higher to road connecting the parallel spokes and have free play in the hitureated portions. The blades to accommodate themselves to the current so that there is no litting of the water as in an ordinary water wheal. It will be ordens that as the water rises and falls, the wheel will like and full with it so that the blades will playays extend to a uniform rise and falls, the wheel will like and full with it so that the blades will playays extend to a uniform that the blades will playays extend to a uniform that the blades will playays extend to a uniform that the blades will playays extend to a uniform that the blades will play a possible the soft with the playage of the soft play the play reflected as follows: On the upstreams size of this structure a wing O (Fig. 2) is built not dissuredly into the stream, so as to direct a large portion of the current between the positions and against the water wheel. In this wing are a number of food gates if connected by mesh of a way that as the value reflect the spice will open, permitting the water rises, the gates will open, permitting the water in flow through them, and thus cutting down the current that strikes the wheel To protect the parts in cold weather, a casing is built over the wheel, at the loop of which is a suction fan F. This is builted to the whole as shown in Fig. 2 Through a duct of a current of warm air is conducted to the interior of the casing by issums of the fan and delivered through the pipe H as indicated by the arrow At the up- and down-gives addes of the easing, hoods J are placed, which opus slose to the surface of the water, and precent the dath bear drawing in cold air instead of the all

hrough the duct G The inventor of this improved rater wheel is Mr W P Spooner, Box 3 "The Manse," arloyale, Saskatchewan, Canada.

CAR-RETAINING DEVICE FOR RAILWAY GURVES.

CARRITATING ENTICE FOR RAILWAY CHAPAS.

In order to leasure the safety of cars when rounding curves, and to prevent the car wheel flanges from
saving under frictional engagement with the rails,
a safety mechanism has recently been invented, which
is pictured in the accompanying cugraving: It consists of a central rail A, that is supported on the time



WETPOD OF BETAINING CARS AT CHRUPS

ed is atrongly braced by means of anchoring deand is atrongly braved by hierars or ancoroling de-vices B, which are imbedded in the around and term-inate in plates C. The object of three plates is to prevent the anchoring devices from working upward. The illustration shows a portion of a car truck pass-ing over the rail A. The acts of the truck are con-nected by means of auxiliary trusses D, below the main trusses, on which blocks & are supported Demain trusses, on which blocks h are supported De-eigned to travel around these blocks E are sudicas chains h fitted will rollers. The rollers are pressed by the blocks E against the guide rail A. As the truck peases round a curve the rollers lend to keep It in place Ordinarily the forward wheel on the outside of the curve tends to bear sgainst the rail, owing to the fact that it is rigidly connected with its n the other side of the curve, and hence it cann mate on the other side of the curve, and shown it cannot travol fraster than the latter. The result is that the fange on the outer wheel is subjetted to considerable war. The centering device how shown, however will prevent the fange of the outer wheel from being and up present against her rails. The guide rail serves to prevent spreading of the rails, and keeps the curve to the contract of the den of Pulga Cal

MARGAGE APPARATUS.

d upon a dovice A patient has reactify been granted upon a dorties for securing a whrater to the hand for application in the operation of measure. The apparatus may be adjustable to adapt it for me by different persons and may be securely champed to the hand, so as to impart to if the whratery movement that is used in certain measure trainments: As shown more particularly in Fig. 2 which it as cross section of the dovice with the witnesser reasoned it comprises a padiest custom the best of the down of the contract of the contract of the down of A parent has recently been grant desired The plate C is formed with two lugs, between which is mounted a screw of and the lister is previously it may by ided with a knurled thumbplets, whereby it may be



TAMASE APPARATUS

Scientific American

turned. The plate B is fitted with a nut H that so turned The plais B is fitted with a nut B that se ages the serve, and as the server is turned the plates are relatively adjusted to bring the horns closer or move them farther apart is this way the device may be clamped on the hand The cushion A, how-wer, renders the device compretate to the operator Projecting from the forward and of the device is a bracket. I as indicated in Fig. 3. to which the vibrator bracket, I, as indicated in Fig. 3, to which the wibstance mechanism is applied Fig. 1 shows the preferred form of vibrator, which has a threaded stem that engages a socket in the bracket I A forbitudy I serves to make the vibrator fast. This type of vibrator is consultant to the vibrator fast. This type of vibrator is consultant to be the consultant to the consultant t

STREET INDICATOR FOR CARS.

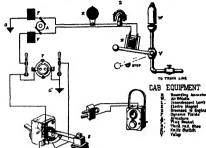
the desirability of having the streets announced by means of a completious sign in a street car has often been urged but littlerto efforts in this direction have Down urgon our surface enters in this direction have net with little success Quite recently when a device of this type was about to be adopted on an important city line the objection was raised that it would ob-struct and detract from advertisements placed in the This objection is overcome in the apparatus cars This objection is overcome in the appearance above in the accompanying angavatings, which not only announces the streets but also displays advertisements at the same time. The interaction house that by making the derive self-paying as well as a convainance to the public, it will meet with botter favor than street indicators hereidors deviced. The prominence of an advertisement placed where all eyes would be concentratively predicted the product of the form of the product of the form of the product of would be concentrated upon it should make this a most valuable advertising medium it is the in ventors idea to use a succession of advertisements so that the display could be changed at each street with the street number. The sign display and street indicator is arranged to be hung at any suitable point

間でっていている。

The railreads have long recognized the fact that what is needed in not manshine to take the place of the engineer, but one which will act an a check under the sugiceer without taking the responsibility from his abcorder—a system that will perform the angi-neer's needs in the con-

any lapse on his part and make a record of this lapse so that the responsibility for fail ure on the part of the engineer will be de-terted A system of this sort was recent iy installed for pur poses of experiment over a abort stretch of the Eric Railroad from the Erie Railroad from Newark to South Patar son. The system is quite ingenious in the fact that it gives protec tion against broken tion against broken rails as well as colli sion, and furthermore is provided with tele onables the engineer to communicate with sta-tion houses along the line when the train is brought to a stop for any reason and oven while the train is run ning at full speed. The advantages of this tele

phone system will be appreciated by passengers who pinnin system will be appreciated by passengers who can use it to communicate with their homes or to conduct husiness while on route and the train dispatcher is sushied to come into direct touch with the various units along the line which are under his in this system the track is divided lute block sections, and the train as it enters each block else trically tests the block shead to determine whether



metal frame of the locomotive. Short cuit be interrupted the magnet H we

cuit be interrupted to valve V to open, thus puttink gized, permitting the valve V to open, thus puttink on the brakes and blowing the whistle W with air from the train line. At the same time the lamp L

FIG 1 -- DIAGRAM OF ELECTRICAL APPARATUS AND CONNECTIONS ON THE GAR OF THE LOCOMOTIVE

STREET INDICATOR FOR CARS.

1

in the car and immediately after passing a street the inclination is actuated to amounce the next sirvet and display a fresh advertisement. This change is effected by means of contact plates which are secured effected by means of contact plates well as we see to to the tross wives supporting the trolloy wire. The contact plain engages a spoke of a wheel, causing the slatter to make a quarter turn and momentarily close an electric circuit coming from the wire that supplies current in light the car. This momentary impulse activates a relay in the apparatus contained within the came of the indicator, and by means of a small electric motor the webs on which the street numbers and signs are printed are turned to the required degree signs are printed are turned to the resulted degree should one of the plates become deathed from the cross wire the conductor can operate the indivator by usans of a switch. When the end of the line is reached the mechanism is reversed so that the street will be announced consecutively in the reverse direc-tion. Behealt the car rows a different set of streets on the return rips, instead of ramping the web forward for the whole round and then rewinding at the start ing point the web may be arranged to bear the streets of the return trip interspersed with the streets of the forward trip and a shutter may be employed to cover rorware trip and a shutter may be employed to cover the streat names of the first part of the trip, exposing only those of the return trip. The inventor of this circest indicator is Mr. It Aiwles, 214 South 11th Street, St. Louis, Mo.

AN AUTOMATIC RAILWAY SAFETY SYSTEM.
It is a comparatively simple matter to develop an absolutely automatic railroad system in which the engineer will be entirely dispensed with and the trains will run under electrical control from some central win run under electrical control from some central controlling station. The reason this has not been done so far, however is because no entirely antomatio engine ig as safe as one controlled by an engineer are is any obstruction on the rails or whether the

The moreovering diagrams litherest, the equipment used. On the locomotive there is a shunt would dynamo driven by a small steam turbine which is amplied with steam from the boller in series with the armature 4 of this dynamo is an incandescent the armature 1 of this dynamo is an in-anciscent imp L a recording suineter R, and an electro-magnet E which serves normally to hold the arm of vaive i on the airbrake pipe of the train. The fields F of the dynamo have their circuit completed through the

would be extinguished and the ammeter would record the time when the interruption occurred. The field iteratic far grounded in the loconsuitre at O and O' Between the fields and the ground O' is a knife switch A mounted on a third rail shee B At the side of each block extending for a distance say of fifty feet is a rail I f (Pig 3). When the shee of sugages this rail it is lifted, opening the switch F and interruption the theory of the property of the control of the control of the theory of the control of the control of the control of the sheet of the control of the control of the control of the sheet of the control of the control of the control of the sheet of the control of the control of the control of the sheet of the control of the control of the control of the sheet of the control of the control of the control of the sheet of the control of the control of the control of the sheet of the control of the control of the control of the sheet of the control of the control of the control of the sheet of the control of the control of the control of the sheet of the control of the control of the control of the sheet of the control of the control of the control of the sheet of the control of the control of the control of the sheet of the control of the control of the control of the sheet of the control of the control of the control of the sheet of the control of the control of the control of the sheet of the control of the control of the control of the sheet of the control of the sheet of the control of the control of the control of the control of the sheet of the control of the control of the control of the control of the sheet of the control of the control of the control of the control of the sheet of the control of the control of the control of the control of the sheet of the control of the sheet of the control of the sheet of the cont

Alongside the track are two lines, U and D, one of nected at intervals with the rails of th track while the other is connected with the third rail sections T These lines C and D run to a station house where the (ircuit is completed through a switch bouse where the irruit to complete through a switch that may be opened by the engineer in charge of the house whenever be desires to stop the trains along the system under the centre! The line C contains a switch a for each block section, which is held is closed position against the tension of a spring by means openition against the tension of a spring by mean of electromagnet p^{μ} . The latter is connected in series with the rails of or its energised by a title opposition of a breakage in one of the rink and is energised by a title opposition of a breakage in one of the rink and its or should a system. In case of the rink and its or should a system in case of a breakage in one of the rail, or should a system in case of the rink and the system is case of the rink and the system is case of the rink and the system is the second of the rink and the system is the system of the rink and the system of the rink and the rink and the system is the system of the rink and the system of the rink and the system of the rinks as a system of th the field circuit of the dynamo on the approaching train with the consequent setting of the brakes as described above. The same result would follow it the described above. The same result would follow it the circuit through the magnet it assould be short-circuited by a train on the block. At P. (Fig. 1) is a plug socket adaptiot to revier the telephone plug connection. The telephone circuit is completed past the writches a through a coil in This resistance permits the passage of the alternating current of the magneto and telephone, but prevents the passage of the direct current to the dynamo so that telephonic communications in the interrupted by the block system.

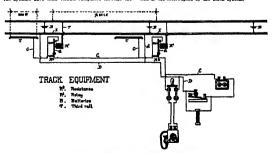


Fig. 9 -- THE TRACE SAFETY AND THEFFERE CINCULTS

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MINISTERIAL DEVICES.

WITTER-FULL — P. C. RIVER. Little Rock.

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connection with the piles.

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Of Concept Interest.

Of General Interest.
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books, etc. This will racillate answering your ques-less. He ster and give titl name and address on every-sheet.
Full bluts to correspondents were printed at the head of this column in the issue of March 18th, 1958, or will be sent by mail or request.

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The Design and Construction of Induction Coils By A. FREDERICK COLLINS

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Billi another interesting ruin is of the se-called RécDeir (the convent), and is resided by an hour a hard climbing along ravines and up rock-hewn stairceases, to the north-resident plant of Kase Parison Passing the striking Youb of the Lions, we receive at lant the high plateau on which long and almost as high, being similar to the Khamesh, having its double rows of six columns each, but widened by consequence on the column of lehmael, who made it their capital and it was k own to the Greeks as Petra it was known to the Greeks as Petra Strab the Greeks as Petra Strab to deserthe traveler and historian describes it at the end of the last century of C, as also did Fitny the Roman A D to Arstan IV King of Petra had a centended his conquests to Damaseus and in referred to by 81 Paul in 11 Cor 13 31 in 106 A D, in the reign of Trajan, it passed under Roman Traveler Correlated bistorians in about the Beciessatical historians in about the fourth century mention it as a Christian metropolis. It continued populous and prosperous as a trade depot until about the beginning of the fourth century when the caravan routes from the north which the caravan routes from the north which had for so many canturies led past its arched portal to the Red Sea were diverted to the Persian Gulf After this it rapidly declined and it is not heard of again until about A D 536 Even its or again until anout A Des Even very existence and site were forgotten until it was visited and identified by Sect sen in 1807, and explored and described by Burchhardt in 1813 the latter galing access to it as he also did to Merca. the diaguise of a Moslem pilgrim

Treesure Hunting.

(Continued from page 222)
a noted Lake diver, devised a diving suit strengthened with metal rings to supp the rubber against the enormous water pressure In this suit Pelky made a successful exploration of the ship but on his second descent his suit collapsed and

he was hauled up dead

Even this fatal accident did not deter he was handed up dead Free this fatal accident did not deter wreckers from planning further attempts on the immesses earge of copper at the control of the control of the control of the beautiful to the control of the control of limits of the control of the control of survival to go down, and to tempt him to make the venture \$3,000 were offered him before he went down and as written promise that he would get one-half the sort retreas from the wreak in addition and retreas the control of the control of \$20.000 for the beastle of his family. But sterm making an examination of the location and the depth of the water, Chair reduced the factoring offer. I likely secondard of great depth to which likely secondard of great depth to which shall be recover treasurem must be scooped with a likite grain of milt. For plantance, John Haggardy, who want down to impose the steamship "Oregon," produced of the Pre-liance of the plant of the plant produced of the plant of the plant produced of the plant of plant to depreve this file hydro-promise charts show that the depth of plant to depreve this file hydro-promise charts show that the depth of plant to depreve this file hydro-promise charts show that the depth of plant to depreve this file hydro-promise charts show the steam (Completence on page 200.)

mod on page 1881)

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from Jars when going over rocks, cloud or numps. The same size cloud or obstruction of any kind naturally offers more resistance to the low than to the high whoel. In plant language, the low wheels must jump over—the high whoels roll over. That's one big advantage of high wheels. It means not only greater comfort but less jar and joit to the working parts of car.

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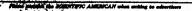


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(Continued from page 237)
must also be accepted with a slight allowance for exaggration

In recent years deep-water salvage of treasure ships has sxcited the cupidity of divers adventurers, and business men.
There is altogether too much wealth lost under the water to suit us. Here is what an expert diver and wrecker has to my

Within fifty miles of Sandy Hook Within fifty miles of Sandy Hook there is wealth enough sunk in the ocean sand to stock the United States Treas-ury All the private treasure ever buried in the earth would be a trife by the side of it The bottome of both the Atlantic and Pacific Oceans are vast treasure beds The man who can devise a means of traversing the ocean bottom might rival A vast amount of treasure in as accurately located as the banks of Waii Street Any experienced diver can take you to a chart and lay his fingers on any one of twenty spots and say 'Go able within fifty feet, dive deep and bring up a fortune—thirty you can't dive deep enough. A great deal of this treasure is the deposit of recent years. Still more went down before the days of ocean titiers At one time specie was trans ported in men-of war Gold dust and dia monds were shipped from mines on rickely schooners for want of better

In twenty years there were nearly five thousand wrecks on the Great Lakus. Of these over one-fifth or approximately one thousand, were total losses. The total rango issues on these wroks are esti-mated at \$12,000 000 and much of it is mased at \$12,000.000 and much of it is in indestructible form of property. These trappeles on the lakes go back to 1800, when La Salier's aligh, the 'Griffon,' dis-appeared in Lake Huron with \$13,000 in coin Besides the 'Ewable' which went down with haif a million dollars' worth of capper, the seamers' if a Coburn' and City of Detroit' were been of Sasin may Day in 1817 and 1875, with exargone stach. Name of this treasure has been re-search. Name of this treasure has been re-ceived. The steamer 'William House.' povered The steamer "William Home." which sunk in 1895 off Swishwah Point, Lake Michigan, carried to the bottom \$20,000 worth of steel billets, and the steamer "Clarion' lost in 1851 between Cleveland and Delroit, carried a deck load of new locomotives to the bottom. ions in new locomotives to the bottom. Iron and roal rargoes have been distributed freely over the bottom of the Orest Lakes and some day the milers of these ores equiliped with improved diving dress, may recover good-sized fortunes from the bottom of the lakes.

Lake Huron is considered the groater scene of treasure hunting, and it is commonly spoken of in lite lumber camps as 'The lake of Sunken Treasures' The reason for this is that back in the early reason for this is that back in the early lumbering days large sums of money were shipped to the numerous lumber camps in small vessels, and literally dos ean of these were lost. All of this noney lies somewhere at the bottom of the lake for the treasure hunter to find

Among the many important wrecks of treasure ships which are partially or treasure abigs which are partially or sately located on the charts of the gov ermunert, mention should be made of the Pacifis Mail steamship "Goldon Gate," sunk near Manzanilis, Maxico with \$200,000 in gold cein and bellion and the Khondtee steamer "islander," sunk of Douglas lissand, Alraks with \$175 000 in gold dust. The excretest prize of all number treasures—If all is true which history records—is the Spanish galleon which went down five miles off Lizard which went down five miles off Litary Point on the Cornile chart in 1754 with \$85,000 000 in gold. The Spanish Stassbill \$85,000 000 in gold. The Spanish Stassbill \$85,000 000 and the ship "Con and American" went down of Havana with a shullar amount in gold. The steamahly "Lexitagion" which went down in Long Island Sound was reported to have contained \$300 000 in specific provided to the control of the contr

The record of these number treasure (Concluded on page 229)

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The 93 unners ment their separate ways with their 5° Colfillies "Takey" cars, each without reference to the control of their cars, each without reference to the control of their cars, and traveled a total dantance of 390, statistics were callected and compiled from the agent and their cars, and their

driven their cars as much as 18,000 miles. The highest individual repair charge for the year was that of one user, whose car cost him—for special reasons which do not reflex upon the construction in the carried being 9,000 miles. Elevan of the others expended during the year from 25 cents to 50 cents. The average distance travaled was 3,118 miles per car, yet the average repair expenses was least han 21 cents per car.

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modern wrecking companies in the rais ing of ships in a matter feating unished of that of raising sunison researces. The feat of the raise is the raise of the ra ing of shine is a metter totally a stalds

ing device the man who descends to great depths must encounter other perils of a blood curding nature Rotting decks and timbers may set a trap for him through which he may fall to his death Long tunnels through deserted cabins and hulls filled with floating objects may tangle up his tube through which fre air resches him and within a space air reaches him and within a space of a few minutes death by safforation fol lows There are grisly wolves of the occast to encountee in some sear writiable man esting abarks and other death-death of the occasion of the deep. A studie false step may precipitate death and yet time is precious and apseed of action must be attained Dark ionsome halls must be attained Dark ionsome hall must be attained Dark ionsome hall the manufacture of the dark in the dark in the state of the safe and one that keeps the attrongent mans nerves a tingle. There are few sights which can equal the interior of a nunken and one that keeps the strongest mans merres a tingle. There are few sights which can equal the interior of a sunken ship whose rich have been rotting be-neath the ocean a warves for a century or more. Some timbers are so well pre-served that they cannot be broken easily with an ax and others so decayed that a diver can thrust a hand through them s diver can thrust a hand through these as easily as a knife goes through these. The diver earns all the wealth that ha gets from a sunken treasure ship and only the hardest and must expert divers will undertake this work. They prefer as a rule to stick to ordinary wre in water forty to fifty feet deep.

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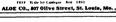




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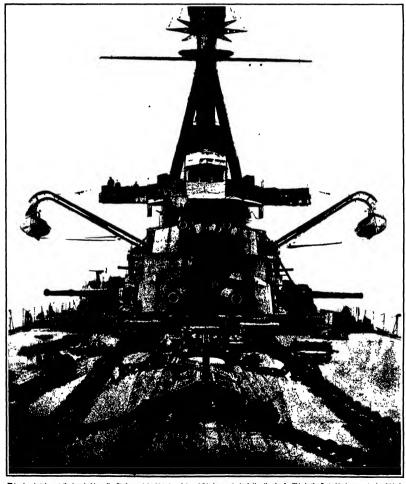






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MONG the many brilling successes of the steam turblue now surpasses the results which have been obtained at the Fifty ninth
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cent issue of the Scientific AMPRICAN gave a preliminary statement of the truly remarkab gave a preminingly statement or the truly remarkanion work which is being done at this station. At that time one of the turbines was in state and the tala had not been extried to full completion. In the in-terlin, more complete data have been secured, and at the last meeting of the American Society of Mechanical Engineers a paper was given by if G Stutt Super intendent of Notive Power of the Interburough Commout of the installation and its results was made

During 1908 it became apparent that the rapidity increasing traffic in the Subway would render it nec mary to provide additional power for the winter of The unit power plant consisted of nin 7 500-kilowatt (auximum rating) compound Corliss engines and three 1 250 kilowatt turbine units for lighting and signal purposes. Of these engines and gen-erator units the authors of the paper say 'In general they are the most satisfactory large units ever hullt. as five years' experience with them has proved

in considering the problem of securing an addi-tional supply of power electric transmission of power from a hydraulic plant was rejected because of the high cost of a double transmission line from the near est available water power and the impossibility of getting reliable service

The gas englue, it will surprise many of our read-rs to learn while offering the highest thermodynamic efficiency would have cost at least 35 per cent me than an ordinary steam turbine plant and its main tenance and operation account would have been from

four to ten times greater
The alternative of hullding more reciprocating gines of the type aiready installed was rejected (in spite of their most satisfactory performance) because of the high first cost and the small range of economical operation the tween 3 to a and \$ 300 kilowatta), the water rate rising very rapidly beyond these limits

As between the installation of high pressure and low pressure turbines, it was found that by combin ing a low pressure turbins with the present engine at least Sunr cont higher efficiency would be secured than with a high pressure turbine unit alone, and it was finally decided to place an order for one 7.506-kilowati (maximum rating) (urbine unit since by this means "the company would not only get an in remains "incompany would one only get as in-crease of 100 per ceut in capacity of the combined engine and turbine" "but at the same time give the engines a new lease of tife by bringing them up to a thermal efficiency higher than that obtained by any

thermal emission infair train that obtained by any other type of sizem plant.

The net results obtained with this first Installation are annuarized us follows. An increase of 100 per cent in maximum capacity of plant, on increase of 146 per cent in repartly of plant, on plant, a saving of approximately 35 per cent of the condensed sleamy for return to the boilers, an average improvement in economy of 13 per cent over

the best high pressure turbine results, an average improvement in economy of 25 per cent thetween the limits of 7,000 kilowatta and 15,000 kilowatta; over the results obtained by the engine units sione, and instity, an average unit thermal efficiency between the limits of 6,500 kilounits and 15 500 kilowatts of 20 6 per cent

These results are surely entitled to be considered as constituting the low pressure turbine one of the greatest triumphs of modern steam engineering AW AMPRICAN GINRATTAR

EY WEST, by virtue of its geographical peal tion stands in the sums strategic relation to the Guif of Mexico and the Caribbean Sea as does Gibraius to the Mediterraneau, and its navat and military importance, which have the results of the late Spanish war and the construc-tion by the United States government of the Panama Caual The transformation of Key West into a grea bayes and military station which shall rival in imperiance the foreres of (libraliar is advocated at as intimately connected as are the navy and the ma-

considerable length to an article by Commodore W H iterator II S.N., Commandant of the Seventh Naval District which appears in the March number of the Journal of the Military Service Institution - The first part of the Commodore's paper is devoted to an are-ent plea for the more complete co-operation of the army and many forces. The army and many should be rine corps, and this connection should include, as far as possible both the personnel and material Guns as pessing our interpretable and material units and ammunition should be of the same general type, with the latter interchangeable and supplies and stores should all be of one standard? It is samitted that ilose relations between the army and navy would be spheet to craftal limitations, but the Commodore urges that it is essential that the coast artillory corps and the navy should be intimately associated for the Melent defense of our seaboard definitely assigned portion of the navy to act as Navy dennicely assigned portion of the may to act as Navy-Coast-Defenders, and in this islass should be included second class battleships or older battleships, the smaller torpedo boats secuts, submarines, mine-lay lux vessels and tugs. "Thir cooperation in the de-fense of any particular navai base should be definitely nranged in time of peace and they should maneuver and drill sow, under the command of a designated officer of the coast defense service, whether he be an army or a naval officer

In his proposal to make of Key West an improgna-ble Gibraiter, it is pointed out that the present de-fenses at Fort Taylor are inadequate for the reason that lattieships can lie at the entrance bnor seven uth of Fort Taylor, beyond the range 12 inch rifle mortars, and destroy Key West from that 12 inch time mortans, and destroy Key West from that voint without being exposed to any dauger the re-maining velocities of projectiles from the direct firing 16-inch and 12 inin jume being insufficient to pene-trate the armor of any battleship, whereas these same scilber gume an aktifiship could shell the city of Key West and completely destroy it

This consideration brings the Commudore to his novel proposal for rendering key West impregnable the points out that in place of high hills or a huge rock as at fibraliar, for the mounting of coast of some guns Key West Harbor, twenty five miles in length, is sheltered on the north by a line of low reefs and shouls which form a complite protection on that side, while seven miles in the south of this line there is a paratlel line of eastern shoals, some of which are rly awash at low tide and none more than eight fost above high water. To build forts on these outer reefs would be so costly that it could scarcely be confort above high water To hold forts on these duter reefs would be so costly that it could scarrely be con-sidired, but Commodore Bechler proposes to take on monitors and older battleships which have passed their period of usefulness on the high seas, mount them in selected positions upon these reefs, and utilize them as permanent turnet forts. Thus, for instance, selecting the shoal known as Rock Key, where there selecting the shoal known as Rock Key where there is a small natural harbor, he would lighten the old monitor "Amphitrite" by the removal of her propoliting engines, haul her into the harbor, halld around the wessel a dyke of piling, rock, and riprap, and thau fill in the space between the inner face of the dyke and the ship with material hydrautically dredged and and the ship with material hydraulically deviged and deposited He estimates that the work would not cost more than \$50,000, and he claims that the sea-coast defenses would thus be increased by a double-turreted fort containing four 10-inch breech-leading riftes and provided with admirable protection. The vitals of the fort, that is the ammunition rooms, turret turning gear etc. would be pratected not only by the armor of the ship but also by many feet of the by the armor of the ship but also by many rect or the line losting earth and ripray. The deck of the monitor would be shout eight feet above mean low water, and the ripray would be carried up the sloping face and over on board, leaving only the turrets and super-

The ship as thus imbedded would furnish, says the ommodors, a complete, modern double-turreted fort,

with every necessary feature to operate the with quarters for the officers and men of the parti-son, and moreover, the entire cost of the installation son, and moreover, the entire coat of the junctuations would be less than the cost of malifications and a ship in the many for one year. The monitors "Miantonomah," "Terror," and "Puritan" could be installed upon the adjacent reefs, and the range of the sixteen 10-inch and 12 inch guns of those forts would com-mand a large part of the Straits of Florids, and especisily that part which is used by westbound vessels entering the Gnif of Mexico which navigate close to the Florida reefs to avoid the strong current of the Gulf Stream Incidentally, it may be mentioned that the dyke would be extended in each case to form a small harbor of rature for turnedo boats and sub-Referring to the proposed island fortifications for the defense of the entrances of the Chesapeake this suggested that it would be a great economy it one of our old battleships such as the "Oregon" were used as a central point about which the island could he built

he built

Now, it is a question of great inkirest and of unquestionable moment, whether this very noval preposal of the Commodere does not provide an opportunity to greatly lengthen the useful life of the bastenship in view of their enormous and rapidly
growing fruit cost the rapidity with which these
something appailing in a few years after their compited on the great such that is the first line of battle,
in ten pears time they are becaming obselve, and fin
fritten years' time they must be religiated to the limfitten years' time they must be religiated to the limthe game and struor has in the line of prover, speed,
and read engalettly. Many of these obsolescent thips,
because of their powerful armor and armanent, would
be perfectly well able to strated up in the first fightbe perfectly well able to stand up in the first fightbe perfectly well able to stand up in the first fight-ing line, if they only possessed the requisite speed and maneuvering quality, and if it should be found practicable to utilise them in the way suggested by Commodore Bechier, their powerful guns and heavy protection would render them most formidable when protection would render them most formidable when mounted as part of the purmaent fortifications of our sea-coast defenses. This suggestion is certain to excite a widespread interest, and we commend it for discussion in our columns by that large and ever-growing circle of our readers who follow closely the divelopment of navsi and military materials.

PAULHAN'S FLIGHT WEAR NEW YORK IATOR LOUIS PAULHAN succeeded last week in getting the bond which he is required to put up in case he files reduced to \$6,000 for one week, and on Friday, March 10th, he made two exhibition flights at the race track near Jamaica, L. I, before some 300 invited quests. Wilbur Wright and his lawyers were inter-cated apectators as it was thought that M Panihan would attempt to fly with his verilial rudder tied or clse without using the stabilizing flaps or allerons There was an 8 to 10-mile breeze blowing, and hy starting against the wind Panihan left the ground after a run of about 75 teet. He rose rapidly, and in rourse of the two circuits of the irack, m 2 44, he reached a height of 75 to 100 feet. The hi-plane flew well and was not affected appreciably by the passes new with same was not ancested appress lamy by the wind Despited the sharp turns the machine did not the very much in making them. It supeared to rock and pitth slightly, but was always under perfect con-trol. The descent was made rapidly and at an anglo of about 20 degrees. M Paulhan made two more cir-cuits. In 2 minutes and 38 sevends.

REQUIREMENTS FOR THE SCIENTIFIC AMERICAN TROPHY FOR 1910.

HE third annual competition for the handsome trophy given in 1907 to the Aero Club of Amorica by the publishers of the Scientific AMERICAN is now open to all aviators. As aviation has at last reached a stage where cross-country flights of a considerable distance are being made, it try lights of a considerable distance are being made, it has been decided to award the trophy for 1910 to the aviator who makes the longest cross-country flight in cacess of 50 miles, which has been fixed as the minimum distance. A round-trip flight of 35 miles each way will also fulfill the conditions. The flight me be made at any point in the l'inited States that is co The flight may venient for the aviator, who must notify the Aero Club of America or the Scientific America a sufficient lime in advance to allow of the sending of a repre-sentative of the club to officially observe it. The competition is international, and foreign aviators are in-vited to compete for the trouby whenever occasion pilowe

The dates of the international balle idane races for the Bennett trophies have been fixed by the Aero Club of America. The balloon race will be held at St. Louis on October 17th, and the aeropiane be held at St. Louis on October 17th, and the aeroplane race above the Hempstand, L. I., plains (probably) on October 23nd. Plans are also on foot to hold big aviation meets at San Antonio, Texas, in April, at Ac-lantic City, N. J. in July, and as St. Louis in October.

Scientific American

ENGINEERING.

The Utilisté Brâtes army has recently adopted a new type of machine pus which can be carried by one man, while ver each gume with a full equipment of stands and ammunitien can be packed upon a mule The new weapon can be first from the abonder 'The barrels are carried in duplicate, and can be rapidly changed when they become based room continuous

ha a resent communication to Pitch on the relative military value of aeroplanes and airship, 60. Clapper of the British army believes that the improved aeroplane will have the dirighth of its merry. He preducts that the future seroyane will be able to accound to heights of 10000 feet and over, from which it will evop down and destroy the more slowly moving dirichbics believe.

The New Marca Railroad has proposed to the sign of Boston to state rists the highest construction of a tupnel between the North and South stations in that city. They offer to speed \$18,000,000 cm the construction of the tunnel whith is to be electrically one ated, provided the city will bear the express of \$10,000,000, which it is setlimated will be the cost of the purchase of the uncessary land.

One of the most requirement of the New York Publi Library, now slowly nearing completion, will be the laye stack room, No feet wide, 100 feet long and 60 feet in height, containing seven tiers of stacks. The metal work of the stacks atone weight about 3,000 tons, and revently, in estimating for the painting contract it was fraud that uperly to pass once through the multitudinous nests of stacks it.

This has situated report on the shooting in the Brit, the hary shows that the percentage of his in rounds fixed during 1900 was 64 67. In 1905 it was 20 67, it 1906, 74 69, in 1907 184, and in 1908, 68 £2. The significant and the 1908, 68 £2. The significant and the 1908, 68 £2. The significant and 1907 the situate of the target was greatly reduced, the number of bits in that year before consistent with the power percentage of the 1908 for the

The pleatag of a large order by the Admirally for liquid fur has det to exaggerated statements in the London Express to the effect that the British easy contemplate the practically exclusive us of oil? There is no truth whatever in this statement. A few handred tone of till will be a raried in future backputs as an auxiliary to exat and oil will continue to be used as fuel in certait, taxees of forpselo busic Graut Dritate possesses no such extensive oil fields as would warrant a drastic change of this character.

A general scheme for constructing a north break water to the entrance of the Panama Canah has water to the entrance of the Panama Canah has enaphroved, and the preparatory work is being does not be proved at Colon, and will shelter vessels which are making the sorth outcomes of the contract to the canada from the video of the contract with the prevail from October to January There will be two jettles of rock, which will cannot from Toro and Manamalite points until they reach deaths of water of 48 and 44 four researchings.

Bone injudicious statements were made recently Representative Rainey about the new 1 in hich coast defense gun, which is undergoing test at Sandy Hook, in the course of which he spoke of the gun as having 'burst' on trial. As a matter of fact, the gun has shown accellent results, and given much sattefaction to the army men. The serident, which was a triviation, consisted in the breaking of a part of the mechanism of the disappearing carriage, which deaded the tests only a few days, and was quickly made and the tests only a few days, and was quickly made

It is now officially stated by the Pennsylvania Rairroad Company that the four tubes under the Rairroad Company that the four tubes under the Rair-River and the electric service as far as Jamaica will trun, under a five-minute beadway, from the new terminal at Thirty-thied fittered to Jamaica without atop, in 18 minutes. The main yard, station, and offices on Long island will be built at Jamaica, where \$4.000-000 will be espended for this purpose. The tunnels to New Jiersey will be in operation by July 1st, and the lines along the north shore to Great Neck estry in January, 1931.

Reyf-goods Blagineering Mr A A C. Swinton describer a stadel steam-propelled scropiane hult by the control of the state of the stade of the O. A. State of the state of the stade of the O. A. State of the stade of the stade of the original state of the stade of the stade of the temporary stade of the stade of the stade of the temporary stade of the stad

ELECTRICIT

In an article in La Revue Electriquo, on the effect of high temperature on Insustating materials used in dynamoelectric mobilency it was pointed out that cotton does not above any lujury when esposed to temperatures below 105 deg C, but that at 115 det C it begins to deteriorate and above 125 degrees it rapidly distinguigates

The separation for efficiency of the New York to be phone severe has a spread all over the swrift of I need to a scriber has been so poor of late that the substantial scriber have organized to demand improvements. Quite recently the Mintsteve de Postre of der Til. Springer of the New York Telephone Company, asking if he would be willing to train at telephone offit laif from the limit of the New York Telephone of the New York Telephone company, asking if he would be willing to train at telephone offit laif from the request was gladily accreded to

An office was recently question to things by the An office was revently question in things by the original recently question of the original recently report when the employer to belany rand to report the Bitarrius Augusta's, a performed paper tape is used, by which the signals are transmitted over the nat high speed. To avoid the overlapping of an ecasivo signals because of the line capacity, each signal is made up of a positive impulse followed by a negative impulse. At the receiving station the message is recorded on a rehemically prepared tape

A recent number of the Electric Italiany Journal describes briefly a peutilar electric becumptive used for canal handage near lireusen. The locumptive runs on a quary, which has to be kept clear for the passage of drays. In order to secures the requisite weight for described, the insometive is built in the form of two inverted Us connected at the top with a girder. The width in dress has been jostly 28 into two and on the drawing motor had to be placed in the upper part of the runture. The becommitte into strades the traffic turbing, the trucks, which peak between the Us and moder the connecting afforce.

A special type of motor has been built for n Brillia proder factory in which presentions have been taken to render the motor flame-proof and explosion proof The motor case is very strongly built, so that it will stand explosion in dust or gases which might find their way into it. The Johns of the motor case are packed with heup rime disped in far this being considered more during the far miner at high temperadicted more during the far miner at high temperature of the standard of the standard of the wort the temperature of the gas in case of explosion within the motor. No eventiation for the interior of the motor is provided, but the easing is formed with corregations with farnish a large cooling surface.

In the discussion which followed the reading of a spayer on undorground conduit construction for large transmission systems before the American institute of Kiestrical Assignments in this goal the following time tration was given to point out the advantages of contrast over the because of its lower thermal conductivity and its better text resistance. A harr-sout cities and its better text resistance A harr-sout coursed us a 1000 900 circum mil 320-mil cable in the indiction of a 9-duct outlet from a manifold sea completely consumed, but the concrete was buried to only a quarter of an into while the concrete was buried to only a quarter of an into while the contrast when in the datus above and to low aboved not the slightest integrated would have been sufficient to dumage the conduit very seriously

The naval gun factor, at Weablington, D. C. be sculpped with six crams fan to tour errance on the first Irack, a 110-tou trame on the next track above and n 200-tou crame on the third track which life feet above the ground floor. The track is louf feet look to the ground floor. The track is louf feet long training the full length of the gun factory limiting that the ground floor. The spin factory life shrink pit is located at one end of the shop naking it a difficult matter to call a certain crame. Acrord findly an annual tator a system has been limitable on each trans with a push future for each crame located on a board close to the pit. These buttons are connected to the annualitator in the crame cab by light trolley wires strung along the web of the Deam that supports the crames in this way ofther trame can be called by pushing the button. If the crame is busy to call with show on the annualcator.

The very first day of the inauguration of letter telegrams proved the fauces of his method of commucation and gave promise of a great future. The principal hushness was done between the large commercial centers, such as New York, Botton, Chicago, St. Louis and New Orienas By this system a Seword message may be sent at night at the price of the ordinary idword message. At the receiving end the message ledeposited in the nearest post office for delivery by the first morning mail. Thus the wives are kept as husy at night as in the daytime. A great deel can be said in fifty words, so list a fulls a lengthy message can now be sent to distant points in iesa time and cost than hormority.

SCIENCE

On March 6th Vesuvius suddonly became active again There was a continuous cruption for twenty four hours of red bot stones and ashes, accompanied by internat detonations Several fissures open-d, from which gas and lava emerged in great quantities

Prof. Wilhalm Trabert has been appointed director of the Central institute for Motocrotoky and Geodynam Res at Vienna, succeeding the late Prof Josef Marta Perner As director of this Institution he is the offitial head of meteorology in Austria

Dr. Paix Exact of Vienna has completed the great treatise on meteorological optics begun by the late Prof J M Penter in 1802, about two-thrids of which had been published up to the time of Pernters death to 1808. It is the only extrustive modern work on this subject

The commission appointed to examine the Leaning Towar of Plan has reported that it thinks its foundations may need strengthening. A spring exists under the tower, the water of which is raised by seem pumps for the use of a local factory. As the bed of the spring is empiled, it is feared, a subsidence of the ground on which the campanite stands will follow

Dr. Harman C. Bumpus, director of the American Museum of Naturest Hatory announces that up to leak August, at least, of Herbaness and R. M. Anderson, August, at least, of Herbaness, from Herschelt island in the from Mr. Hieffenseun, from Herschelt island in the Artit Creen intelled August 19th 1909 has been received telling of the adventures and successors of the part;

This sake which the American south polar expositions that set there is portrum in the upstion of SR feet should be therefore the upstion of SR feet should be the constant disaments as upone had ever inseed in the place whore the exploring party purposed to land limited whore the exploring party purposed to land limited whore the exploring party purposed to land the place whose his day ever seen is not there attempts there was an ice cliff 150 feet high which was caired land SIII, Americans might find stant in that locality.

Dr Le Faguays recommends a process of disinfection which constants in blowing upon the contaminated surfaces a current of air hoated to a very high temperature (600 to 900 deg F). This process may be applied not only within buildings, but also to the surface of streets, yards, etc. The apparatus is heated by petroleum and is very simple. This process not only destroys disease perms but it is very efficacious against fiess and other vermits.

Mahas has devised a process for the manufacture of sipituries at blazed upon the semiograment of the ultraviolet rays emitted by unrunry vapor image. A mix rer of air and sulpharons acid gas is introduced into a tower, lined with lead, into which water is injected in fine jeis. Under the influence of the ultraviolet radiation of lamps in the tower, the sulpharons acid sentirely converted into mishuric acid. Several towers are connected together. The strength of the ani burner of the control of th

The Zoppelia North Polar Exploration Younstities and recently under the Presidency of Prince Henry of Walls of the Polar State of the Polar State

For once the bacteriologists and hygienists usually appear to detight in starping thoud folk ar nounce a discovery which will reassure those per who are afraid to eat green regatables. Manau thought that he had discovered soil microbes in the interior of vegetable stalks From this discovery resulted the condemunation of sewage farms and, indeed, of all market gard-ning as it is ordinarily practised, with the employment of manure Fortunately this opinion has not been shared by all bacteriologists. In order to soire this problem, which is so important from the hygicale point of view, Remlinger and Nouri have mid-riaken a series of experiments, in which they on deavored, by every possible means, to infect plants with nilcrobes in every case however, they found it impossible to obtain colonies of microbes from the Itence they Interior parts of the plants thus infected conclude that the microbes in the soil do not pene-trate into the interior of plants, but remain entirely amon the surface

NEW ARROPLANCE AT HOME AND ADDROAD

THY TABOUT K NO. 3" APRILANC.

A noteworthy acroplane so far as actual llying is
succerned is the "Baddock No. 2 of Messrs McCurdy and Baidwin, who are still working with Dr. Bell near Baddeck, Nova Scotia. As our photographs show, this biplane is an excellent fiver. It has made a consider able number of more or less lengthy flights above the ice of Lake Bras d'Or, in a number of which passengers were taken

The planes of the McCurdy and Baldwin machine

are 40 feet long by 7 feet wide at the middle, de-creasing to 5 feet at the ends The wing tips which are doubt and at inched at out of the main planes, are about 5 by 5 feet in size. They are binged near their front edges, and rocked is the usual manner by means of a fork fitting means of a fork fitting around the aviator's shoulders. The horizon-tal rudder consists of two superposed surfaces spaced 30 tuches spart, and mounted 15 feet in front of the front edge of the main surfaces. The surfaces of this rud-The surfaces of this rud-der are 12 feet by 28 inches in size. A biplane tall is also used, the planes being the same size as those which form the

as those water with the front ruder. This tail is mounted it feet from the rear edge of the main clanes. The horizontal and vertical rudders are open clanes. hipken is other words, a push forward or a pull backward on the wheel directs the machine downward or upward Turning the wheel to the right or left

steers the machine sideways.

The motive power of this biplane is a 8-cylinder Kirkham automobile motor of 40 horse-power. It is was not cooled and develops its rated power at 1,400 R.P.M., at 2,000 R.P.M. it develops its horse-power.

The radiator is novel, consisting of thirty flationed tubes 1½, feet long by 3 inches wide by \$7.53 inch like! These tubes are curved from front to rear in the same manner as the main planes, and sufficient lift a solution do support the vight of the radiator and water carried. The motor is greated to a single 7 foot 8 inch propoler having a foot pitch, by most of a tokin, the ratio being 3 to 5. The threst obtained a sufficient to drive the machine at a speed of over 40 miles an boar.

The third features of Messars McCurdy and End-



The Herring Biplane, showing novel stabilizing fine. a foot operation of the horizon a skid instead of whosis, etc.

wins biplane are the use of a comparatively heavy 6-cylinder automobile molor and the fitting to the machine of a biplane tail of the same shape and size as the horizontal rudder The 6-cylinder motor has been found superior to the 4-cylinder for automobile work, but this is the first aeropiane, so far as we work, but this is the first seroplane, so far as we know, to be fitted with this type of motor. Is placed low down upon the lower plane in order to keep the center of gravity low while the propeller is mounted higher up, so that the center of thrust abail bo as near as possible to the center of resistance of the aeroplane. The usual three-wheel chaisis, first used by the Aerial Experiment Association, of which Mesers. McCurdy and Baldwin were members, is fitted

After making numerous satisfactory flights above After making numerous satisfactory flights above the frozen surface of the lake, Mears. Baldwin and McCurdy were visited on the 8th instant by Major Mussell of Ottawa, who represented the military department of Canada. The two inventors made five surfailtion flights for this office, and finally be consented to make a flight as passenger with M McCurdy A very matifiation.

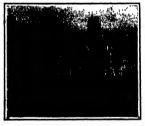
tory flight of several min utes' duration was made.

Mosers McCurdy and Baldwin made a number of
flights last summer and
fail in Canada, and the Canadian government is very much interested in their machine, and will doubtiess eventually purchase one for military use The noteworthy point about this machine is that its makers have hulit it sufficiently large to carry a weighty and re-liable motor, and there is little doubt that the ma-chine is capable of making extended flights with-

THE NEW HERRING BIPLANE

THE NEW REARMS SITABLE.

The best constructed acroplane on exhibition at accordance of the fournal, was the new biplane of A. M. Herring. The photograph of this machine, reproduced shore, was taken at the time of the trial flight on March let, and it if yet on a very good idea of the biplane's nows freshres. The spread of the planes is about 28 feet, and the foreand-aft width about 4 feet, the total supporting surface being 220 square feet. A 25-horse-power Curtise motor Deling 220 equare feet. A 25-horse-power Curtiss motor is mounted upon the lower plane at the rear, and car-ries upon its crankshaft a 4 bladed 6-foot propeller of 6-foot pitch, designed by Mr Herring. The total (Continued on page 240.)

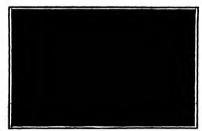


Capt. Baldwin's novel bipiane. The radder above the upper plane is worked by a fork fitting about the aviator's shoulders. It corrects the aids-tipping of the seroplane,

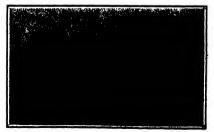


Hesers. McCurdy and Buldwin flying in their " Baddock No. 2" biplane.

This is the first aeroplane to be equipped with a six-cylinder matemobile motor. It has made many as flights in Canada.



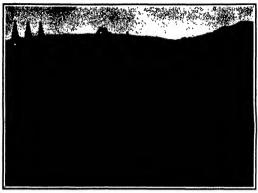
Sir Riram Maxim standing behind his new hiplane, ier in many respects to the inventor's gigantic aerophnic built nearly 20 years ago,



Rear view of Steriot XI, 56 meneplane, showing the new tail. Note theteren plate covering of the body, and the large horizontal redder at the sour and of the ball,

BUILDING THE OLIVE BRIDGE DAM FOR THE GATGEILL WATER SUP-

Work on the Catakili Work on the Catastii water supply, which will provide New York with five hundred million ga-lons of water daily, is making ateady progress, as will be avident from as will be avident from the illustrations of this work which are herewith presented Briefly stated, the scheme consists of the construction of a large reservoir in the Esopus watershed in the Catakills, watershed in the Catakilia, with a storage capacity of 127 billion gallons and an aqueduct 23½ miles in length for conveying the water to the New York city line The Anhokan reservoir, as it is called, will supply the city with 250 million gallons daily in addition to the 275 million gallons now available to gallons now available. ion galions now available in the reservoirs of the Croton watershed. As the Croton watershed As the future needs of the city demand it, reservoirs will



ent condition of Olive Bridge dam as viewed from north bank.

be built in the Rondout and Schoharie watersheds adjoining the Esopus Vali ley and from these three dams it will be possi-ble to draw sufficient wa ter for the full capacity of 500 million gations daily of the new aqueduct. The latter passes through the Croton watershed and in Croten waterstied and In itwo years time, and before the full completion of the Ashokan reservoir, a portion of the water stored therein will be available for delivery through the new aqueduct to the new (roten dam The work is to be completed by Probrusty, 1415.

The Olive Bridge dam which will create the

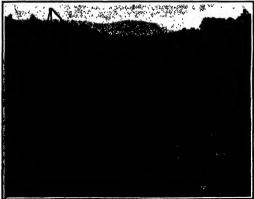
which will create the Ashokan reservoir, is a linge structure with a huge structure with a maximum beight from the iowest foundation of 240 feet and a width along the crest of 4830 feet The central portion imme-diately above the river is built of cyclopean mason-ry and extends for 1 000





A completed section of the 924-mile steel-and-concrete squeduct

Upstream side of Olive Bridge dam, diversion tunnel for carrying river during construction





litto of dam, showing the 8-dust pipes for passing river through the work.

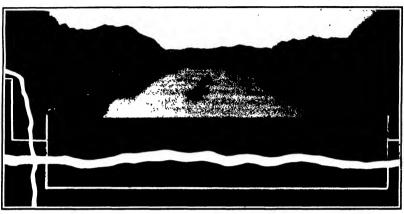
Placing steel reinforcement for the concrete squeduct,

for In whith The test of the dam combite of a central manager, one wall and carefully fail and of olled earth. In addition to the main dam there are loss earbe of embourness known as known as the heave Kill and titudy allow the former extending for 111st feet, and the latter for 2200 feet. In addition to the works there is a waste with 1 too feet in bruth and eighter the manager and earthworks necessary to close the valley depressions and raise the water to the deleted being the manager five and one half miles in agency and the contraction. had been reached, a large culvert, 35 feet wide by 40 feet high, of sufficient has to take error of any possible goods coming down tae wiley, was formed in the colors coming down tae wiley, was formed in the color of the color

above mean see level. Its thickness bell by 25 fields at the creek, its maximum thickness at 'the base show 200 feet, and the mananty went will contain 555,000 cubbc parks of material. The maximum whither of the exchanded-over-well wings of the fam will be shown 500 feet, their top width, about 24 feet, and the total quantity of embankment will be about 2,000,000 cubb parks. The stewards of the discharge will be 180 cut shows the face.

yards. The stevation or the uncourage with the control feet above tide level.

The Beaver Kill dikes, which have a total length of about 2.8 miles, will have a maximum height of about 110 feet above the original surface, and they will con-



Cross-section of the Hudson River near Corawall, showing how the Catakili water supply will be carried under the river in a pressure innsel in the solid rock 1,800 feet below tide level

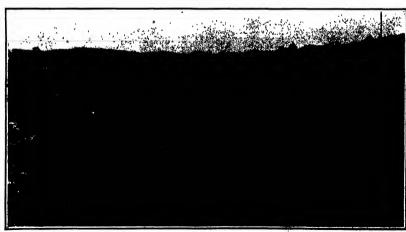
The accompanying photographs, for which we are indebted to the Max active Brothers Company, who has neverted for over twelve and a half million blocks reserved to Huserste the character of the work The earthest of the operations consisted in providing a bypass in the form of two 8 foot steel pipes for carring the work for the Eugona Creek past the dam during the work of exavation, and the construction of the measuring up to the level of the river. When this level

havy sited I beans were placed transcreeply to the sale of the tunnel from which the forms with their sper in combent load of masoury were suspended by vertical tie-ond. To facilitate the flow of the water, the wooden forms will be left in place until the dam is completed. Then the flow will be diverted, and the tunnel will be dilted in with masonry. When this completed, the filling of the reservoir will take

place
The top of the Olive Bridge dam will be 619 feet

tain about 5000,000 cubic yards Like the earthen portions of the Olive Bridge dam, they will be built with a concrete core wall. The reservoir will be divided by a dike into two basins. This dike will have a length of 1 li0 feet, and the dividing woir will be of the same length.

it will be readily seen from these figures that the Ashokan works are on an immense scale. They in volve over 2,000,000 cubic yards of earth and 425,000 (Continued on page 249)



Valley of the Keepus Dam is foreground with river flowing through completed pertion of temporary tamed.

BUILDING THE OLIVE BRIDGE DAM FOR THE CATERILL WATER SUPPLY.

Scientific American

Affinition and the first section.

A very important case was recently decided by the suppleme Court of the German Empire, First Civil Sensal, in which the rights of American patentees in Gur many are defined. The facts in the case are hriefly

The National Cash Register Company of Berlin, as instituted lishibity company theorycontect under the Cermans law, is the owner of three Germans pasents. In Germany the passense must work an invention within three years from the date of publication. That term and expired for all four passates. Proceedings were in stituted by Schubert & Satter Marbins Works in the ground that they had not been worked to an adequate extent in Germany, and that it all their essential parts the cash registers protected by the patents were manufactured to the patents of the patents were manufactured to the patents of the patents were manufactured to the patents were made and the patent was in substantial agreement with the American patent was in substantial agreement with the American patent was in substantial agreement with the American patent covering the identical points of invention, that the other three patents were not worked to the German Simpler, but that their revocation would not revoked all flow patents (see high patent was in yet patents, and that the other patents were not worked to the German Simpler, but that their revocation would not revoked all flow patents (see patent was in yet patent was in the december of the American patent cited by the deforedant

the American parent cited by the deviousline of the control of the

The first question which came up before the court was whether the American company could be permitted to act as the defendant on appeal in view of the fact that the German company had been the defendant when the action was brought before the German Pattern and the control of Section 286 of the German Pattern and the control of Section 286 of the German Pattern and the Company for the German Company as defendant to foreign a company for the German Company as defendant of the treaty of February 23rd 1999 between the German Empire and the United States of America relating to the mutual protection of Industrial property Tatal treaty beams a German law on August 184, 1999, and affected the pattents which had been assigned to the American company. The treaty company The treaty of the Marketon Company The Company to the Company The Company to the Company The Company The Company to the Marketon Company The Company to the Marketon Company The Company to the Marketon Company The Company to the Company T

The Special Supplement.
The opening strike of the current Stormanter, No 1785, as by J. Banner, Director of the Department of Research in Terrestrial Magnetism, in which he describes the instruments and mathods of the codes magnetic work of the Currenge Institution of Wash-

ington. The article is claborately Illustrated. Extracts from affective submitted in the case of Wrightve Paulhan, as well as Judge Hand's decision, are
given in this decision the Parman, Biferiot, and
Wright machines are considered from the patent law
yer's standpoint. The Berlin correspondent of the
Sciverure. Automos writes a flactitating article on
Sciverure. Automos writes a flactitating article on
Seems aimost incredible that hivelite particles amailer
seven than atoms can be counted, and yet in this artite the method of so doing in described. Frof K
Svehis points out the distincting qualities of a said
iron. The powerful passengers and fright inconnotive
of the Mallet type recently built for the Atchism. The
Decayer's article on the articles all industry is continued. P. H. Cowell writes on Halley's count cawar from the such He gives a table of edigite coordinates in two declinal places at latervake of four
days through as are centeding from one end to the
other of the fatter vectors of its critic, as well as. a
May, also the position of the comet on twenty
seven days measured from perthelion passage in days
Some newel tops are described and illustrated

A German Antaretia Kynedition.

A German south polar expedition has been virtually arranged by Lieut Flichner of the General Staff, under the auspices of the Geographical Society Lieut Flichner announced at a meeting of the society that the expedition would start in October of this year if

the appearance would be a seen of the provision over the necessary funds were forthcoming. The plan is to send a vessel with provisions over the route followed by Lieui Blackiteon and form a depot at about the half way point to Shackiteons winter headquarters. The recutier expedition small start from Weddell Land on the opposite side of the pole and make a dash at rose with the depot as object.

Dr Penik, chairman of the Geographical Society an nounced that an anonymous donor had given \$15,000 toward defraying the cost of the expedition, and Lieut. Flichner had promises of a further \$15,000 it was hoped, he said, that they would be able to send out two

Lieut Filchner is an explorer of experience lie was one of the first to reach Lhassa, Tibet, and in 1903 and 1905 he explored Turkestan and Persia

The Life of Hadlum

As interesting and informative popular lecture upon the wonders of radium was recently delivered the wonders of radium was recently delivered the wonders of the Authors' Club in London by silf william Ramany, KCB in describing the wonders of this element the eminent chemist confined himself mainly to a description of his own investigations and experiments. In dealing with the Alpha particles are specified to the control of the silf will be a silf with the control of the silf will be silf will will be silf will be sil

Radium was the most concentrated form of energy known it is n substance which goes on changing into other things to which various names have been

ing point, and its specific gravity

given These substances were named radjum A, radium B, radium C and no on up to radium P. Some had a very brief existence issuing only thirty or forty minutes, and he had never sees them. It isnd seen radjum D which would be gone in about forty years. This was a substance rained wall looking like lead and that was nearly all he could as a shout it. There were other substance rained will like pointum which Madame Carle discovered. During this, a manation radium gave a great dead of energy generally manal feeled as light but as a matter of far radium large of the could be acknowledged to the could be acknowledged to the could be acknowledged to the could be acknowledged. It was found that I gave off about \$5.00,000 times as much heat as would be given off by the oxylydrogen blooping, which gave a temperature of over 2000 dog Crnt.
What did this energy do.* It event out the Alpha.

What did this energy do." it sent out the Alpha rays at a velocity of about 400 million per seemd, and these partities naturally sarried a great deal of energy. The Deta rays, although out should must thus anoth part of the size also carried it meadons—early owing to their raws, now booking, which exacts of that of the Alpha rays. They could decompose water and metallic substances, and in these decompositions they to the size of were surprised to discover lithium in what romained, and no traves of the copper said. It had repeated the experiment size times, and the experiments were still scoling on

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Prises for Small Asroplanes.

The practical utilization of the acroplane is the obet toward which the efforts of all constructors and experimenters are directled in furtherance of the amen object, the French National Aerial League offers two prives for small and easily managed servojanes (the prival of the Practical National Aerial League offers two prives for small and easily managed servojanes of the League, will be awarded to the first art and, horsfords with frees and to leading on the same road after making a continuous flight of one kiloneter (§ mile) or more. The other prize, of 1,000 frames (about 3200) will be awarded to the owner off the mailest acroplane which shall make a continuous circuit of one kiloneter. The size of the arreptane will be estimated by multiplying toughter the three maximum dimensions of the mass time. The competition related provinging the competition can be obtained by addressing La Lique Nationals Aerienne 27 Rue de Rome, Paris

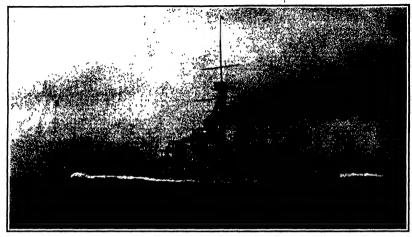
The number of factoria continued in sulfa in-reason were rapidly from the moment of milking for a vertain time, and then slowly decreases Some bacterilooksis have attributed this plan someon in a harder-ficial power possessed by the milk due to some undestrible ingredient Experiments have been made to isolate this hypothetical substance which appears to remain solving up to a temperature of 10 deg F The milk was filtered harouch a power skin cyrlinder, and the filtrate many milk, but no combistive results were obtained. The real explanation of the permitded power of milk is much simpler. The nidity of milk continually increases with age and thus milk continually becomes a sense favorable medium for the growth of hactria. The bacteria also have to contend a title the increase with develop very registy in sour milk and ne gon early victorious in the structer for stabilined it is early victorious in the structer for stabilined.

240

THE BRAZILIAN BATTLESHIP "RIFAS GERAES" in the early part of this year the first of the dread nought battleships the Minas Geraes" about which much speculation has been rife, was handed over by the builders, Sir W G Armstrong, Whitworth & Co

of Elenick, Newcastle-on Type, to the Brazilian government thus definitely disposing of the supposition that the vessel was designed for some other power This vessel has been the source of considerable discussion, since it represents the last word in heavy bat-

cahip design, and is at present the most paperfully need warship about. Through the content of Adrial Maurity, the president of the Brazilian maval numisation in England, appointed by the government the South American state to unpervise construction.



Length, 50 feet. Breadth, 36 feet. Reread displacement, fight, 11:00 toot. Horse-power, R.Eh. Speed, H é boots. Armoor: But, block, attenting for full beight of bull, increts, block; two protective deets. 14 not not fuce Armoonent: Tweir-defaulter libest, twenty two I toot. Pour toopeds tabes.

TER BARGLAND BERESONERS' WITHER SERIES."



Busing the gun trials of the "Binas Gerass" ten 13-mek guas were trained on the broudestle and dimburged simultaneously. The combined energy of the projectiles amounted to 500,000 foot-ten, or sufficient to lift the play hedily 20 foot late the air.

we are enabled to publish the accompanying photographs and to give the leading particulars regarding this, the latest dreadought.

The gaseral appearance of the vessel may be gathered from the accompanying illustration? The overall length is 548 feet, molded breadth 53 feet, molded all length in 848 feet, molded breacht 35 feet, molded deepth 4.35 feet, displacement 15,000 tons, speed, depth 4.35 feet, displacement 15,000 tons, speed as the second reseast of the series conceptions at Barrow, is of the reciprocality form-cylinder tiple-expansion type, driving twin three-bladed propellers. The cylinders have a diameter of 38 inches for the high-pressure, Si fockes for the three-mediates, and 73 inches for the low-pressure, with a common stroke of 42 inches, and on the forced of trial at 1240 popmds pressure developed 27,112 indicated horse-power, giving a speed 2714 knots.

trial at 280 pounds pressure developed 27,412 indi-cated horse-power, grings a speed of 14 kenot.
The outstanding feature of the ressel, however, is the arrangest. The meta armor on the breadded anddehlps is 9 inches for a depth of 22 feet, 5 feet of which actions below the normal isod water line. The forward and at the factlets are protected by a trans-rers 8-link armor bullhead, while forward and att the hull is protected by 6-inch beit armoring tapering to 4 inches at the extreme ends. There are two proto 4 inches at the extreme ends. There are two pro-tective decks, the upper being 1.25 inches thick, and the water-line deck 2 inches thick. Ninc-inch armor is also need for the npper strake amidships, and the 47 inch guas of the secondary armament are mounted withinch guns of the secondary armament are mounted with in the citadel thus formed In regard to offensive arm

ament, the main battery comprises twelve 13-inch 46-caliber guns Four are carried in pairs in two turrets in tho center tine of the ship, both for-ward and aft, the remaining two
pairs being
mounted on either side amidships. in order to permit e to be trainthese to be full arc of 180 degrees, the super structure is cut away fore and aft. It will be readily seen that the upper deck of the vessel is left ciear of all ob-struction, a factor which is one of the outstanding features of the design It will be seen also that the pairs of guns for-ward, as well as those aft, are stepped, the upost pair be ing soms 12 feet shove the level of those below, so as to enable the up

per to fire over the lower pair. It will be seen from this arrange-ment that a terrific gun fire can be concentrated on either side, for the forward and aft two pairs of guns can be trained through an are of 150 degrees on either side of the center line of the ship, thus giving a fire from oither broadside, including the pair of guns amidfrom other broadside, including the pair of guns amid-able of ten 15-linch guns Morrovor, owing to a pair of guns fore and aft being set at a higher clevation, they have a corresponding sidvantage in action. As these guns fire a projectile weighing 850 pounds, this means that an aggregate discharge of 3,500 pounds can be concentrated from either broadside. In the ac-

can be concentrated from either breatests. In the secondarying belowgraph takes, drung the gun tales a full acceptance of the secondarying below the secondary to the anniabing pums on either breatest believe to training through an are of 180 degrees, it is possible to five eight 18-inch guan sheet or setting. The secondary arranement comprises 47-inch guan and 2 pounders of the quick-first gype. The cutting superstructure of the vessel has been no designed as to carry four 47-inch weapons arranged in pairs one above the either on either side of the bridge at the forward end, with a significal disposition art. These gues fire forward and aft, parallel with the conter time of the eithy, but have no considerable skiple of five shade. gues are roward and art parallel with the center line of the ship, but have a considerable shige of fire abaft the beam. Also six \$-pounders are similarly mounted forward and aft in the same superstructure, while two other \$-pounders are engried on the top of each of the

gun houses of the upper level pair of guns. On the main deck there are seven 47-inch guns monated with in the citated of Funch armor, on either side, and the arrangement is such that the guns can be trained through an are 650 segrees on other side of the outer line transverse to the keel, so that they can be trained asters and ahead. Altogether there are twenty-two 47-inch guns included in the secondary armanout two 47-inch gans included in the secondary armamont. The result is that in action the vessel can pour a broad side from ten 12-inch guns firing 50-pound shelfs, cloven 47-inch guns firing 45-pound shelfs, and six guns firing 3 poundor projectiles. As all are of the guns firing 3 poundor projectiles. As all are of the latest quick firing type, a comprehensive idea of the formidable character of the attack of this vessel may he obtained

erating mechanism is olectri hydrantically driven, electricity being used for training the turrets. In addition there is emergency go ing the turrets in addition there is emergency genr for every operation. Immediately the gun is fired an air blast cleans it and the rammer is fitted with a water spray, so that in the event of any sparks remaining when the breech is opened they may be et once extinguished The accommodation for the per sonnel is most adequate and commodious especially in regard to the officers' accommodation, and in view of the hot climate in which the vessel is to be in service special attention has been devoted to ventilation navigating bridge has outer wings, which are also re-moved when the ship is cleared for ection



This graceful structure, recently completed, takes the place of a primitive rope ferry.

THE FIRST METAL BRIDGE TO BE RESCIED IN AVSHAUISTAN.

the representatives of several powers were present therest. The trials served to dissipate conclusively many approbanions that had formerly been enter tained. For instance, there was considerable discussion as to what effect would be produced upon the gua crew in the lower bare-tie of the fore and aft 13gun crew in the lower barbette of the fore and at 13-inch guns when the weapons immediately above were discharged in the first test the crew were withdrawn from the lower gun house when the upper pair was fired. It was cound, however, that the roof of the iower house offered a complete protection against the hlast, and that the crew could safety stay in the lower house without experiencing the slightest iti effects of the tremendous blast some five feet above their heads It was also considered that the principle of setting the fore and aft guns one above the other and at a dis-tance of 36 feet center to conter was objectionable, on the pica that the siming of the upper guns would be interfered with by the flash from the guns just below. interierru with my the main from the guns just below, but here again practical trials dispersed any such ob-jections. These results, by the way, corroborate cer-tain results obtained some years ago by our own Navy Department at Indian Head, when this system of mounting, first proposed and adopted in our "Michiand "Bouth Carolina," was tested.

Cement for Aquaria - Equal parts flowers of suiphur, puiverized sat ammoniac and iron fitings, mixed with good inseed oil varnish and adding enough white lead to make a solid, easily workable mass.

THE FIRST HIVAL BRIDGE IS APPRANTATED.

The accompanying itius/ration represents the Directors are supported by the first metal bridge to be erected in Afghantian, which was opened last year. The structure opens the Kabul River at the mouth of the famous Directoith Gorry about seven mitter from Jaliabed Prior to the erection of the bridge communication was maintained between India and communication was maintained between India and the adjacent country by means of a primitive native ferryboat, or raft, composed of akins stretched taut on a framework of rough timbers, and lashed to-gular by means of crude native-made rough A cable was stretched across the river, and when the latter was at its normal stage the raft was pulled from one bank to the other by this means Whet, however, the waterway was in flood, and the turbulence and velocity of the current provented recourse to the rope the raft had to be rowed across the river, an opera which required considerable destority with the primi-tive cars used. The journey was somewhet danger-ous under the circumstances and the opposite bank was only gained some considerable distance down-atream. Owing to the rude character of the ferryboat a capelee was by no means infrequent, and inseveral lives were lost from this cause every

chosen for the structure was just off the old Kahui read As the photograph shows, the gerge is extremely wild at this point, the recky cliffs dropping straight down

The contract was Mr J R Halli day by the Cat-cutta engineering firm of Messra. Burn and Com-

pany, Limited
The bridge has
a span of 396 tower centers with a clear width between parapets of 10 feet. It is defeet. It is de-signed for pedes-trian and light vehicular traffic character of the site combined with the fact that none but unbor was available, rendered the task somewhat diffi cuit The shut-ments had to be blasted out of the solid rock, as did the roadway spproaches on either side On the Jailahad side these preparawith the setting of the foundation boits were

pleted in sevon and a haif weeks. Work then had to be suspended for seven months, as the services of the Afghan isbor was required in Kehul Upon resuming operations, work was continued without further inter-mission and the bridge was erected in the ectual working time of five months. Considering the nature working time or new monton. Considering the mature of the work, and that the unity laborers were quite unacquainted with the tools used such a performance was highly creditable. A further month however was ed in blasting out a roadway and approach to the bridge in the cliff face on the Lagna side of the river The bridge was opened by His Majesty the Amir of Afghanisten smid much ceremony and before huge crowd of natives, who fined the precipitous hillsides to witness the povel spectacle

Until a few years ago, all public coal lands were valued uniformly at a rate of 250 or 310 an acceptancy at a rate of 250 or 310 an acceptancy at a rate of 250 or 310 an acceptancy at 250 or 310 and 250 or 310 or 31 Until a few years ago, all public coal lands were at the prices now fixed

BIRDS AS WESTSAWISMS

The casual observer knows the birds as he knows the free the stone or the mea shell—an incidental object of passing interest, one of the trivial details in his every-day life The covice bird student knows the birds, few or many species, by the clothes they ine diras, two or many species, ov the chains they wear so to speak. It somewhat adept, he may even recognize birds by flight and song. Even the more profound ornithodopist classifies birds by external character—largely bill feet, length of wing and tail, number of feathers in each, etc. He is of necessity a specialist paying particular attention to classifica He is of necessity tion precognaphy of the study of plumage ornith ological esteology or some one of the sub-divisions of the economic atoms of bleds. Lew individuals among my of the classes of students mentioned sufficiently appreciate the bird as a mechanism designed to play a certain part every member like every detail of some complicated and perfect machine contributing toward perfecting the whole for its requirements
Considering the bird from this standardist and

analyzing the parts with a view to their functions it seems natural to com cause It is the enterlor extremity and because the Importance of its This one featu a hirds mechanism merits treatment in an article especially devoted to it and has, in fact re-coived such treatment.* it can be briefly reviewed only here The hill not ingly performs the func-tions of a mouth in birds, but also serves as a hand Having none at all on the posterior limbs, and only unsatisfactory substitutes on the anterior ones. bill largely in theu of a hand, and do so to a very considerable degree

As has been shown, the hill largely conforms in shape to the requirements of the more important functions that it must perform, and exhibits a very wide range of vari aty in size and shape. It is used for cutting tear-ing, and chewing food of various sorts and for various sorts, and for seizing, spearing, or en-guifing prey It is also used to dress the plumage, and by some species, such as parrots, to assist in climbing Birds' skuils, having a

less diverse range of functions than the hills. correspo smaller degree of differ entiation, but they do vary to some extent according to the habits and particularly according to the orders in the lower the orders in the lowioons, and most of the sea birds, the brain cavity is relatively small, but proportionately larger

to the higher types, such as the thrushes including

The vertibral portion of the skeleton pining indithe verteral portion of the agencial planty indi-cates the hird's descent from successful sixth common with that of reptiles Modern birds being no longer provided with reptile-like talls, as was the case with the earliest types (the archeapteryx had twenty candal vertebres the bony structure of a long lizard like tall, each vertehra supporting a long feather on either side) the number of caudal vertehrs has become re-duced to usually nine and these are short and with little apparent function, other than to support the feathers of the tail, familike, about the outer bone

The bony structure of the wings is an adaptation of the bones of fore limbs to the requirements of flight the cones of fore nimbs to the requirements of flight in evolutionary history this adaptation was principally accomplished in the lizard like progenitors of birds and the modifications since them are not remarkable. The main arm bone the hunerum and the secondary ones the nima and radius are not very differ

· Hird Hills ' by D. S. Howdish, According Homes and Cardons, July 1926, vol. III, No. J. pp. 83-87

ent from the corresponding bones in mammala. the hand, however, the first and fifth fingers have dis-appeared the index and third digits are small and artely functional, while the middle finger is greatly eveloped and furnishes the real bony support for the tlp of the wing

Wings for the great majorily of birds are solely organs of flight, in a few species such as the ostrich they are rudimentary and functionless serving at tury are runmentary and tunctioniess serving at best only to preserve symmetry in such apocies as penguins, however, while useless for light, they are valuable as flippers or paddles, assisting progress through the water in a very few cases they are used to assist the bird in climbing mushly largely while immature, as in the heatzin of South

Next to the bills and wings the feet of hirds are erhaps of the greatest functional importance. Feet and logs vary greatly, accurding to the usage for which they are designed in the ostrich, which most which they as uearly resembles in its mode of life some wild horse the development of feet and legs is strikingly like that of the feet and less of such animals. Birds like

nicher's bill 8, black skimmer's bill 4, bony structure of bird's foot cysuckies, 2, memo's bill 9, beron s bill 10, the caprey's foot, 11 c ernale), 14 gere's bill 13 and 10, bill of drouge, related to slineks, not of a barnyard fow); 18, foot and leg of rhos, South American cetts

THE RIND AS A MECHANISM

the kingdsher and humming bird whose feet are solely for perching have absurdly underdoveloped, small, and weak looking feet and legs In the hirds of small, and weak looking feet and legs In the hirds of prey the feet are practically grappling hooks, de-signed to secure the firmest hold of the virtims, the legs are heavy and strong Birds like the herons the legs are heavy and strong Birds like two neroms acc storks. and cranes, who spend much time wading, have very long legs and long, slander tors, which, spreading over a wider surface, give a support ana-logous to that afforded by snowshore. This feature logous to that afforded by snowshoes This feature is more strikingly illustrated in birds like the rails. that travel about on the yielding aquailc growth, and finds its highest development in the jacanas, tropical and sub-tropical birds of the rail family Wood-peckers creepers, and nuthatches, birds that cling a pecares crospers, and nuthatches, birds that cling a great deal to perpendicular surfaces, have very sharp claws and foct adapted to such requirements. Birds that swim a great deal have the feet webbed with a membrane extending between the toes, making very

The fiesh of hirds is no iess efficiently designed as disposed toward the fulfilling of the requirements of the birds than the skeistal structure. The mere important muscles are possibarly designed to reader the greatest efficiency. The powerful nuclei that operate the wings have their eacherages on the keel of the breathone, and the latter is particularly despit developed in hirds of most powerful sight. This is true allow of the manufact of are bird, with its immense wing area to maintain agreed for hours in suiling, and of the humming hird with its relatively small wings. driven at lightning speed to keep the hird poli

in all of the passerine or perching hirds, the muscle and tendon arrangement of feet and legs is such that the weight of the body resting on and contracting the logs draws the muscle over the main joint, and draws up on the ends of the toes, looking their grip on the perch. The same principle drives the talons of the hawks and owls into their prey
Tongues in birds are also highly functional

Tongues in hirds are also highly functional in woodpeckers they are practically barbed spears, and the extreme protrusion that they are subject to is provided for by roots that extend around the back of the head and close up

to the eye-sockets. In the the nectar from flowers.

in some species it is brush like, to facilitate handling the food, and in certain fish-eating species the upper surface of the tongue is covered with points inclined he kward, facilitate swallowing the slippery prey
The eyes of owis, de-

signed to see at night, are wonderful structures. Only a small portion of the entire eve-ball is visi-Each so ket on uples skull space The visible eye-ball is mounted on a thin bone frame, some-wint resembling a lampshade in shape, a stru ture differing radically from the type of hird's eye

The feathery covering of hirds is especially adapted to their requirements it is light offerbe carried in flight, and a poor conductor of heat poor conductor of heat and cold, affording the bird the best protection in the audden temperature changes to which it is subjected. In birds like subjected In birds like the penguins it is more like the hair of seeis than rmal feathers as thoroughly waterproof The feathers of ducks and water fowl generally are also practically water-proof The power of flight is quito dependent on the feathers both of wings and tail which in action are spread to give the greatest supporting area for the air pressure to act

ism, so perfectly do all its parts contribute to an absolutely smooth-working whole, in the bird, that the very wonder of this intricate machine passes unnoticed as a common-place

Matal filament lamps generally are supposed to be of a pretty frall nature, so that the alightest touch breaks them. This idea is counterarted by an account given in the Electrical World of a collision between given in the Electrical World of a collision between a Pennayivania eastbound passenger train and an empty engine just outside Jersey City on the morning of November Std. This accident resulted in comparatively few injuries to the passengers, due to the fact. The contract of the comparatively few injuries to the passengers, contract the comparative of the second comparative in the contract of the second considerable. One of the steet passenger conclusing in the steel plates about 18 inches. Included in the lighting evilupeant of this car were nine tangent lamps, and it is interesting to note that, after the recent three lamps were found to be in perfect the recent three lamps were found to be in perfect to the contract three lamps were found to be in perfect to the contract three lamps were found to be in perfect to the contract three lamps were found to be in perfect to the contract three lamps were found to be in perfect to the contract three lamps were found to be in perfect to the contract three lamps were found to be in perfect to the contract three lamps were found to be in perfect to the contract three lamps were found to be in perfect to the contract three lamps were found to be in perfect to the contract three lamps were found to be in perfect to the contract three lamps were found to be in perfect to the contract three lamps were found to be in perfect to the contract three lamps were found to the lamps were foun

Scientific American



EXPERIMENTS IN CRYSTALLISATION

The making of crystals of various kinds outside s chemical works or chemical laboratory is not often practised, because it is commonly considered that the practised, because it is commonly considered that the subject is a very difficult one or that it requires a complete knowledge of -hemistry Sub-however, is a mistaken idea from either standpoint Crysials of extraordinary beauty both in geometrical form and brilliancy of color can be produced by any purson de-termined to make the understaling successful. The accompaning illustration shows a groun of py-ramidal crystalline structures that have been formed in the national crotiers.

The red is made of hichromate of potash, the white of common alum, and the blue of sulphate of copper

Many saits can be employed that are very cheap, and after the crystals have been formed the solution left over can often be used. The geometrical forms of the crystals can be observed during their formation, and it is interesting to watch how they grow as the liquid deposits the excess of sait. When finished, they can be dried and preserved under a glass covering like wax flowers so as to preserve them for ornament and for educational purposes

To produce results as illustrated make a nyraunid out of three pieces of wool five inches long, and a quarier of mi inch square. Wind each stick with col-ton twine from end in end. Bind these three strips well at the apex of the pyramid and then for the base make a little triangle of the same sized strips each inter being two and a hair mines long. Content these firmly at the corners with sealing wax, then cover every part neatly with a winding of cotton twice Now diatend the free ends of the three longer uncon, and featen them to the base with sealing wax after which carefully cour nil the waxed parts with twine For a fine pyramidal block, ni white remojer ent crystals prepare a small quantity of concentrated on made by adding powdered alum to pint of boiling water until no more will dissolve Dip sitton twine covered tripod or pyramid into this solution, let it soak for a minute, then stand it in a plate to cool. When cold it will be coated all over with very fine creates of alum. This is the starting point to build up the flual crystallization. Examine the minute crystals with a magnifying glass, when it will be seen that the face of each crystal is triangular the corners being out off small or haw large the crystal may be, it always asmes the same geometrical form, for every sait crystailises in a form according to its nature

Procure a two-gailon stoneware crock and a c rivare a two-gainen isoneware crox and a one-gallon glass baltery jur. The battery jar should be eight laches high and six inches in diameter. Pour seven pints in beiling water into the stoneware crox & Add therein about five pounds of powdered nium, a few ounces at a time stirring the solu-

tion well with a tienr strip of gisss As soon as the hot water will dissolve no more alum it is then saturated and must be poured theu saturated and must be poured into the giass battery jar, which has been proviously warmed, straining the solution of alum by tying a three-fold piece of cheese-cloth over, the top of the jar Now piace in the battery jar a circular-like ild about ½ inch deep, such as the ild of a paste jar 8st upon this lid a piece of glass four about a time of the piece of glass four and the lid a piece of glass four and a haif inches square and upou the glass the slightly crystallized pyramid completely immersed in the solution and weighted down

the solution and weignted nown with a large almo crystal or a heavy glass stopper A small regretal or almost almost stopper A small placed upon the top of the pyramid All must now be left to cool gradually. Under so condition must the wessel be disturbed, because this

confiling must the vessel be distribed, because the would cause the alum to be thrown down in a few minutes in very fine crystale like common sait/ At the end of worst-four hours, the whole of the pr-gunds will be covered with beautifully formed crystals. At the end of fort-right hours, the premain may be 'emoved, and the alum solution made hot cross more, adding more request aim to maturate the solution; poor this solution spain has desired the solution; the pyramic with the abret glass base, affect this to

stand for a week, when it will be found to have become a mass of beautiful crystals, clustering into one solld mass. The pyramid must now be removed (the giam plate also by a slight tap) a pint of clean, cold water poured over it, then stood upon folded hotting paper twier daily drain changing the hotting paper, wiere daily for a week to nino days, when it will be found that the rystals will become almost !ransparent The pyramid belug complete it may now be covered with a smillable glass dome and it will form a unique and tustructive Several sets should be made from va salts in various colors. All of them can be carried out

ely the same manner as described for The following salts are not expensive and will give the various colors stated They will not become maist upon exposure to the atmosphere For white builst upon exposure to the atmosphere. For white common alour and name sugar, red potassitut bl chromatt, yellow, yellow prusslate of potash, dark green, double sulphate of nickel and sumonta light green (shorate of nickel)

There are very many other salts that will give a



RED, WHITE, AND BLUE PYRAMIDAL CLUSTERS OF CRYSTALS

great variety of colors the majority of them being deliquement becoming motel and melting upon ex-posure to the almosphere but these enumerated here will be permanent under all ordinary conditions

SIMPLE METHOD OF PRODUCING THE SERMAN REFECT WY W & 4 4 8 9 9

The world was startled when a few years ago, Prof Interest world was started upon a rew years ago, from Zecuma nanounced that if pieces of sodium were burned belween the poles of a pawerful electro-mag-net the spectroscope would show the D line much broadened while the existing current was turned on, and that the uriginal aspect of the line would be red as soon as the current coased

The experiment confirmed the much-discusse ory of II A Lorontz who assumed that the hitherte was as a matter of fact heterogeneous and composed of minute particles or vortices in the (ther of space baving a definite mass and possessing all the proper-ties of uegalive electricity. These particles, or var-tices, which are now called 'electrons' he conceived tiess, which are now called "obsertous" he conserved as wibrating about the common center of gravily of the atom and further that light was due to trans-verse vibrations in the other generated by these rap-lally moving electrons tr argued lorents, the atom de up of such particles or vortices, their rate or vibration would be altered by the times at force in a magnetic field and we should be able to predict their behavior with accuracy Goling back to two swinging penduliums for analogy, he pointed out that any mo-

etic itees. Fig 8.—Looking at right ancies to the · APPARATUS FOR PRODUCING THE ENIMAN REPERT ١,

tion to which the electron is subject could be re into three components one in straight lines parallel to the lines of magnetic force, and the other two at right angles to them, but since these last two can be further resolved into two circular motions (one to the Aght and one to the teft) around as axis parallel to the lines of force, we can say that the motion which the electrons are capable of making may be divided into component number I in which the electrons are moving parallel to the lines of force; component num-56 2, in which they move with the hands of the clock,

and component number 3, in which they move against the hands of the clock. Now suppose we took at the vapor of sodium in a magnetic field and along the lines of force. Consider the electrons as negatively charged, and the ilnes of force runnin charged, and the lines of force runnin oward you what will happen? You caunot see any effect of component number 1, since the electrons of that component nent are moving in the line of your vision and since electrons smit waves only at right angles to the litue of sight, hence to see the waves of component number 1, you would have to move your position and look at the hurning sodium at right angles to the look at the hurning sodium at right angies to the lines of force But with components numbers 2 and 3 the conditions are very different. Here the electrons are revolving in circular orbits and in a plane at right angies to the line of sight, and since those which move with the hands of a watch are retarded, and those against he hands of a watch are retarded, and those against the samels of a watch are accelerated the single lim seen to the spectroscope would spill into two, or as in Prof Zatumin state, where the spectroscope was of small dispersite power only a broadening of line would be observed. This then, was the experiment which startled the scientific world, startled it because our of the fundamental principles of science was apparently overthrown—the homogeneity of the atom of the chemist

Notwithstanding its value and significance the ex-NOWHERSANDING Its value find significance, the ex-periment is rarely witnessed because of the ponder outs and costly apparatus necessary to produce the di-vision of the spectral lines. Powerful gratings and magnets both exceedingly expensive have up to the magnets both exceedingly expensive nave up to the present time been used in the demonstration. The writer however has a very simple piece of appara-tus central less than \$30 with ahoas the phenome-non admirably. No takim to originality is made save in the matter of its arrangement, which has so simple as to be well within the grasp of any intelligent boy. instead of the powerful spectroscope the reader will observe in the accumpanying photograph a little inter ferometer attached to the telescope. This is a modification of Fabry's and for it the writer is indebted to the inventive genius and the exquisite mechanical ingenuity of Prof. Pfund of Johns Hopkins liniver And instead of the huge magnet used by Zee man one weighing less than farty pounds is found more than ample. The photograph shows a piece of hoard six inches long to which is attached A a ions of three inches focus. B a Nicul prism which can be of three inches focus, R a Nicol prism which can be revolved in its brans collar the interferometer D the telescope and O a spring tilp for holding the quar-ter wave plain. This appearatus is simplicity listif is always in adjustment and can be rapidly shifted to view the phenomenon along the line of aight and nt right angles to it

Instead of burning sodium let us use a tube con taining helium gas, and place the apparalus so that we may view the light parallel to the lines of farce we may view the light parallel to the lines of furce and through the hole drilled in the pule piece of the magnet as seen in Fig 1 Examine the ginwing lube before the magnet is energised and you will see sov-eral concentric reliew rings in the field of the iele-

Fix your attention upon any one of the rings which equivalent of the yellow line that would b the magnet, and lostantly the yellow ring splits into two Revolve the Nicol but you cannot extinguish two Revolve to Noon in you cannot extinguish the rings because just as Lorents predeted they are circularly polarised. Now introduc a quarter wave pints the offset of which is to produce a retardation of one-half

wave length The light is now plane polarized and can be tinguished by the Nicol—a furth-er and a beautiful confirmation of Lorentz theory to much components numbers 3 but component number 1 can 3 but component number 1 can not be seen since its electrons are moving parallel to the lines of force. Now take out the Nkol and move the apparatus Nkol and move the apparatus on as to view the light at right angles to the lines of force (Fig. 2). Turn on the current and one yellow rings is observed to break up into three Let us analyze them bearing in mind what Lorentz said viz. these lives component number I was polarized lying in a hori-

sonial plane, and that the other two, components hum bers 2 and 3, were polarized in a vertical plane ver-tical because in this position we are looking at the edges of these circular vibrations, and the effect upon us ts as if the particles were actually moving verti-cally. Now introduce the Nicol with its short diagonal vertical, two rings appear, and with the short diagonal horizontal one ring appears a beautiful con firmation of one of the eleverest rest pieces of reasoning

in the whole realm of physics there is nothing mur-

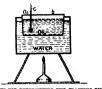
Scientific American

striking, more significant, and the effect which it is destined to exercise upon the future of science is siminculculable

SOME SIMPLE TESTS FOR OILS.

There are several tests which anyone can apply without the use of special apparatus, and tell something about the grade of tubricating oil he is getting ---

Pince a small amount of the oil to be tested in a



APPARATUS FOR DETERMINING THE PLASHING POINT OF OIL

nan as indicated at a in the accompanying engraving, pan as indicated at a in the accompanying engraving and heat by means of the lamp beneath As the tol heats apply a match at b. After a time a flash is seen when the match is applied, but it disappears as rapidly as it came. This shows that enough vapor had been produced to mit with the air and form an explored mistiary. The temperature, given by thermometer c, at which this overwr, is called the fashing point, as one higher temperature if a match is applied, the oil takes fire. This latter temperature is known as the burning point, and may be a considerable number of degrees above the flashing point.

Dissolve a small amount of sodium carbonate in an equal volume of water Place it, together with the oil to be tested, in a flask or beaker and shake thorough the control of the control o tity of precipitate will be a gage of the amount of acid present.

TO DETRAT THE PRESENCE OF ORIT
Drop a small amount of the oil on white or very
light-colored bioting paper The oil will be absorbed,
and the grit will be visible as small black specks on

TO FIND THE TEMPERATURE AT WHICH THE OIL CONGRALS TO FIND THE TWIFFEATURE AT WHILL THE OIL CONCELLS.
PRIL 15 parts of Glubber asize into a beaker Place
in this a bottle containing a sample of the oil. Place
over the sait a mixture of 5 parts hydrochloric aid
and 5 parts of cold water The temperature is reduced slowly, and can be observed from time to time
as the oil (blickens Any freeding mixture or even ice
can be used in place of the above.)

THE IONISATION OF AIR.

MOMY SIMPLE PERSONNETS

The terms ions and electrons have now become familiar in the explanation of electrical phenomena. Most of the investigations upon which they are based how ever have been made in rucus, and co are but little understood, except by those scientists

who have devoted their energies to their esp atndy There are however many simple exp stly due to Right, which can be made in air at the ordinary pressure, and which form a useful intro tion to the study of ionization. The accompanying illustrations represent some of these typical simple experiments performed by Mr C J Watsen of Birmingham, which aroused considerable interest at a rehis courtesy we are able to explain how they were car ried out and how they may be repeated by any inter

It is well known that if a nointed wire he com-It is well known that if a pointed wire be con-nected to one pole of an influence electric machine, and the other pole is earthed, a discharge of electric-lty will be obtained. The proof of electric discharge may be easily verified by means of a lighted candle may be easily verified by means of a lighted cannie and a gold-leaf electroscope if the former is placed on the cap of the latter, the electroscope, even if dis-posed several yards from the machine, will collect continuously the electricity discharged from the macontinuously the electricity classariged from the ma-chine Similarly, if the action is carried out in the dark, a small stream of purple light may be seen, which although excredy visible, will carries a pro-nouncedly marked indisence upon an exposed photo-graphic plate Another mothod in which this dis-charge may be ascertained in to place a condensor, charge may be accretained is to place a condenser, comprising a piece of giasa 1/16 inch thick coated on both sides with tufold to within ½ inch of its edge, opposite the point of the wire. Then connect the two opposite coatings of tinfell with a strip of the same material, which has a line out in it. When the re-verse side of the condenser is connected to earth, there will be a distinct spark jumping across the par

row gap.

If this das-barge point then be immersed in a metal box fitted with an opening which is covered with per forated sine, so that the electrified air is forred through the perforations, if the box is earthed it will be found that the air which is thus expelled is totally despired of electric charge. It thus appears that the



olectric charge is not carried by the particles of air generally, but by a smaller number of what for the

ent are generally described as ions.

veral simple experiments may be carried out to several simple experiments may be carried out to secertain the paths pursued by these ions. For in stance, take a sheet of ebonite the reverse side of which is coated with tinfoll and earthed, and place it which is coated with tinfoil and certified, and place it a foot distant from the discharge point. It is advisable to pass the sheet over a gas fame for a few seconds before each experiment, so that any electricity present in the sheet may be eliminated. When the discharge from the elsevier mension is carried out for about one second, the about will be charged auxiliarity. No visible effect of this occurrance will be

observable; but if the sheet is sprinkled with a mix-ture of powdered red lend and sulphur, and the same experiment is repeated with an obstacle of near-ounrial interposed between the quering material interposes between the disconarge point and the sheet, such as say a cross, an image of that object will be produced upon the plate. If naga-tive electricity has been discharged from the electrical point, then the sulphur will collect on those parts



Fig 12.-Foreing a discharge through a sinc sieve.

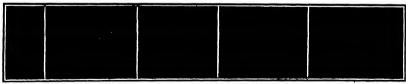


Fig. 18.—Rifect of ultra-violet rave on since

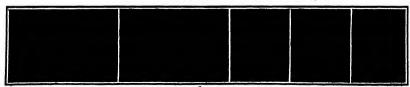
distely beneath the object, while the red lead will adhere to those parts sharged negatively by the unimpeded discharge on the surrounding areas. The drawing, Fig. 1, shows how the experiment is carried out, while the photograph, Fig 2, gives the result of the interposition of the cross in the path pursued by

The image of the object is usually enlarged, but this The image of the object is usually enlarged, but this factor is influenced to some extent by the iength of time of the electric discharge. A preferable method is to take a sheet of cellinioid, as shown in Fig. 3, perforated with holes at regular distances. Then when the image of these holes is obtained, as shown in Fig. 4, the distances between their centers can be m When the distance of the ebonite sheet is varied (the when the distance of the sponits sheet is varied (the distance of the celluloid sheet from the electric pole being kept constant) it will be found that the size of the image grows with the distance, but not proportionately. The electrified particles or lone travel along the lines of electric force, and consequently generally in curved lines. This has been proved by using, in stead of a point, a long thin wire held parallel to the interposed sheet of reliuloid when the lines of force tre circular area passing through the wire, and strik-

ing the ebenite perpendicularly to its surface
it will also be found that the streams of ions mutually renel each other, so that if the electrified point very near to the celluloid, the individual imof the holes will be found to have entered themselves at the expense of the intervening spaces and will even be observed to have assumed almost a square form, as shown in Fig 5. This is of course analogous to what is observed with the cathode rays of highly exhausted as osserved with the cathode rays of highly exhausted tubes. A similar repution is also manifested when an insulated metal object is used as the interposed ob-ject. This is illustrated in Fig. 6 which represents the effect produced by a piece of brass tubing on the end of an aboute rod, both being of the same diameter. (Continued on page 250)



Figs. 2 to 6.—Shadow effects produced by interposing non-conductors in a stream of electrified particles.



Figs. 7 to 11.—The effect of an air blast on the discharge, and of Secting a discharge through perfected also.

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TRW ARROPLANDS.

1Confined from page 236)
weight of the machine complete is
about 400 pounds. The thrust obtained from the propeller at 1,200 revolutions is in the neighborhood of 200 pounds. The simple surface horizontal rudder is ariled upon holler Inclined po 12 lest in advance of the main surface, 12 lest in advance of the main surface, and the single surface tail is similarly carried at the rear. The machine is mounted upon a cutral runner having two smaller skids at each side. There also a skid at each and of the lower

plane
The novel features of this machine
are the foot control of the horizontal
rudder, and the system of triangular
vertical fins on the top of the upper
plane for the purpose of maintaining the plane for the purpose of maintaining the transverse stability automatically. The aviator silk upon a small seal located in front of the lower plane and clings to two inclined bases running out in front ive in like d bases running out in front to vertical strate connecting the poles that hold the horizontal rudder. These inclined braces can be recully seen in the photograph as well as the pedals for the feet of the aviator with operate the horizontal rudder. The vertical rud-der is worked by a small lever hold in the aviator's right hand, and the spark and throttle control of the motor is also conveniently placed

conveniently placed
The theory upon which the transverse
fine (each of which has about 2 square
feet of aurface) operale in order to
maintain the transverse stability of the
mas blue, is as follows. When the
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the contents of the marbine, is as follows When the ma-chine lips to one aide it has a tendency to slike down toward the ground end wise, but as the weight is placed very low and as the fine offer resistance to this slide motion the upper part of the this side motion the upper part of the machine is retarded, while the lower part swings over like a pendulum, and the mischine regains an even keel. In the first nat the surfaces is which are of special paraffin-cated silk) were very to the state of special paraffin-cated silk) were very to the state of special paraffin-cated silk) were very the state of special paraffin-cated silk) were very the state of the state of

toose owing to for and danippess, and once the man blue was in the air it was neces sary for the aviator to sit well over to a difference in lifting power of the two sides of the machine. The biplano rose readily after a run of about 85 feet The machine is said to have tifted at a speed of about 22 miles per hour horizontal rudder was turned too far and the machine shot up to a height of 40 feet at an angle of nearly 30 degrees 40 feet at an angio of meanty '19 degrees' as Mr Herring attempted to make a turn after flying some '00 feet, and the ma-china turned successfully thipping in-ward at an angio of about .9 degrees from the horizontal and unsking a 40 degree turn. He then cut off the spark and descended In allubitur the sent was split and a runner and one of the inclined rods were broken According to the inventor, the maritime rose to the air with the sylator (who weighs 190 air with the aviator (who weighs 190 paunds) with a thrust of 140 paunds, and he believes that a thrust of 80 to 87 paunds is sufficient to fly it. The throttle was not fully opened, and the moior, he thinks developed not more than 9 horse power when the machine was in flight

This biplane is the first seroids: ily in New England but it is primipally noteworthy because of the new method of automnia stability which apparently rms to work fairly well

Mr Herring has replaced the vertical partitions of the Voisin bigiane (which partitions if the Voisin bigians (which inputed the unda industrial to ends and at various points in between) by the six small irisuguist fine shown. If these small fine placed shove the unner plane, answer the purpose as well as do the partitions in the Voisin machine, can readly see that they offer much less resistance and skin frition to the air, and should make a much faster ma-thine. They form a means of automatic stability which is a decided im provement over worping wings or mov

able wing tips (Continued on page 247)



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(Continued from page 246.) One of our illustrations shows the new

hiplane of Capt T A, Baldwin, the dean of practical American aeronauts. This alipiane of Capit T. A. Baidwin, the deam of practical American aeronautu. Tala saw hiphane has a number of original properties of the control of the contro has been tried out by Mr Curties, who laims that it worked satisfactorily upon nis machine

The new bipiane has a spread of 28 feet by a fore-and-aft width of planes of 5 feet which makes an area of 280 square fest of the main pianes. In addition to these there is a small biplane tall carried on a there is a small biplane tall carried on a triangular frame extending back from the main planes and mounted upon a light skid. The vertical rudder is placed in the center of this isll which forms in reality the horizontal rudder, since the iwo surfaces are moveable and are naed to direct the machine up or down

to direct the machine up or down.

The arrangement of the power plant and aviators went is just the opposite of the usual arrangement, and is along monoplane lines. The motor is at the front edge of the lower plane and the avi front edge of the lower plane and the avi afor a seal above the roar edge. The fly whit of the motor extends below and above the plane. The propeller is placed half way between the upper and lower planes and is driven by chain from the motor. It is a large, high pitch propeller of between R and S foot diameter.

The aeriplane is mounted upon two pneumatic-tired wheels in front and a single skid at the rare. The regular Cur-ilas single-wheel control of the rudders The machine has had several is fitted. The machine has had severa successful tests upon the frozen surface of Lake Kenka, at Hammondsport, N. Y.

THE STREET 1910 NOWS MOTOFF LAD.

The latest model Bieriot monoplas THE RESIDE 1919 YOUR MOTOFICE.
The latest model Reviet monoplane
known as the "No 11 bis" is shown
from the rear in one of our illustrations
on page 236 As can be seen at a glance
the body of the machine is now complete. ly covered, while a new form of tall re-sembling that of the Antoinette mono plane has been fitted. The horizontal rudder is in two parts hinged at the rear edge of the tail proper. The spread of odge of the tail groper The spread of this new model is 72 meters (23 5 feet) the wings being about 11 x 7 feet in sixe and having an area of 12 square meters (129 6 square feet) The length of the tize square reet) The length of the body has been reduced from 7 to 66 meters (2164 feet) The total weight is 310 kilogrammes (5826 pounds), or with aviator 832 pounds This means a lift of 646 pounds per square foot of the deoply curved surfaces. The highest lift per square foot hereto fure obtained has been 5 pounds, so M Bieriot has apparently improved his ma chine in this direction aithough he has not diminished its weight but instead hes into minimister in weight of the first and increased it in order to give it greates as record. The first and the f oreased it in order to give it greater pushed forward or pulled backwaru of direct the machins down or np, while it is moved sideways to warp the wings and rrect the transverse equilibrium

SIR HIRAM MAXIN'S AMOPLANE Authentic States or page 216.)



Some Inside Facts about the Enger 40 That the Prospective Automobile Buyer Ought to Know

MARIA UNE TRUSPECTIVE ARROMONDE BUYET UNGON TO ARROW

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ENGER MOTOR CAR CO., Summer and Geat Streets, Cincinnali, Chic

(Continued from page 247) concerning the seroplane which Bir Hiram Maxim has built at Crayford, Hiram Maxim has built at Crayford, Kent England No small degree of se-creey has been maintained, but to those who are acquainted with Sir illram's theories, it was evident that he would have the present aeroplane on the main principles which governed the design of the remarkable machine which he built and tested at Baldwyn's Park In 1894

The present machine is the outcome of his original researches and of plans dwitoped during the last five or six years but not until 1908 was the veteran inventor able to devote himself fully to the planning of a new flying machine He also set himself designing a gasolin motor, as he hold the idea that much of the trouble with the present zeroplanes was due to the unsultable on gines employed Sir Hiram has new evolved a flying machine in which every portion from engine to propellors has been constructed according to his own ideas. His first care was to reduce the proportions of the machine as rom pared with those of the gigantic appar atus which he constructed at Baldwyn's e is 44 feet, while his earlier multi plane had a span of over 100 feet

like its prototype, the new seroplane is of the multiplane type, and is in effect made up of six aeroplanes, sach being 6 feet 6 inches in width, fore and being 6 feet 6 in hes in width, fore and att. The planes are notably thin, and are neatly covered with waterproof sile fabric very tightly laced Poun the property of the planes of the planes of the course of the proper sile of the planes of curred as to produce automate interest are at stability to a very high degree There are balanced ruidors fore and att, and a horizontal steering ruidor. The Maxim patent device for varying the pitch of the planes when in dight was the planes of the planes when the planes of the area of the planes when the planes of the planes when the planes were planes of the planes when the planes of the planes o warping device The wings are moved in one direction by a lever worked by hand, while a spring controls them in the reverse direction

The engine is mounted between the planes, and behind the pilot, who sits in a low metal-covered compartment with the steering and control wheel in iruni of him. This disposition gives a very clear lookout, and at the same time the aviator is better protected from the the aviator is better protected from the wind A highly more feature is the pro-peiling grar. On the engine shaft is one small serve propeler mounted at the rear of the planes. This serve travels at the same rate as the engine shaft, and serves also as divided. The serves also are supposed to the serves are serves as the mounted higher to be twenty the the planes and driven by calles whose tension is outgoined by focker utilities. tension is controlled by jockey pulleys The small seres and one of the large ones rotate in the same direction, the ones rouse in the same direction, the other large into in the opposite direction. This acrew is also given a finer pitch and higher vehicity than its companion, and in this way its gyroscopic action. belances the joint gyroscopic action of the two propellers, which rotato in the Dyerse direction. This arrangement of In the engine, too, Bir tiram has shown how closely he has studied every phase of the problem. He has selected a special brand of Vickers etcel as the material for his 4-cylinder 60-horse power motor, and has been enabled to re-duce weight while leaving a good margin of strength Special care has been given to the carburder and the valves Sir with far greater regularity and amouth on than the average aerial motor on the Continent The engine is fully water cooled and the radiator is mount ed under the upper plane in a manner suggestive of that adopted by Santos Duront on his little monopianmost ingenous system of automatic
forced feed lubrication is employed,
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(Concluded from page 248.)
which carries oil to every working part of the engine in a very effective manner. Indeed, the new motor promises to set a splendid example in aeroplane engia splendid example in aeroplane engi-neering, for it shows that, by skillful designing and the choice of sultable ma-terial, a light motor can be built with all the refinements which are now usually fitted to high-grade engines for motor-car work. The spasmodic action of many acroplanes at present in use is du-largely to the fact that their engine

interpretable

The new Maxim aeroplane is mounted on wheels fitted with nest shock absorbers. Regarding the machine as a whole, its riean lines and uncommon aswhole, its clean lines and uncommon spect are the most striking features. There is a noteworthy absence of the complication of stays, guy wires and framework, which on many biplanes cause so much head resistance. The grouping of the various organs has been very skillfully done, and as far as Seen very untillity done, and see he ra-possible those parts which set up most resistance are set in the same lines, one behind the other thus ministring wind resistance. In effect the whole machine bears evidence of remarkable originality, both in its general form and in its main that the second form and its main hill an apparatus like that designed by whill an apparatus like that designed to thise can drele in a captive sates around a steel mat. When see many other ma-chines, however, are experimented with in free fight by avisions of small exin free flight by aviators of small ex-perience, the Maxim method may not seem altogether necessary, aithough with a striking new type of machine it is undoubtedly a very sure course of pro

THE CLIVE BRIDGE DAW

(Continued from page 288.) cubic yards of rock excavation and 7,200, 000 cubic yards of embankment and re-000 cubic yards of embankment and re-diling. The plant of the contractor at the Olive Bridge dam consists of four cubieways, about 95 feet in height, which watend across the valley above the dam with a clear span of 1,530 feet. The crushing plant, with a capacity of 200 tons of crushed atone per hour, and the tons of crushed stone per hour, and the concrete mixing plant are located con veniently to the work, the material being brought below the cahieways, by which it is deposited as desired along the atructure Work was begun in the fall of 1907, and at the present time about 25 per cent of it has been completed

per cent of it has been completed.
The total longth of the aqueduct
(which is 17½ fort wide by 17 feet in
height) from the Ashokan reservoir to
the city line is 93½ miles, and its cent
will be about \$45,000,000. To render
the work perfectly secure and perman
and wherever the accurate and perman
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or wherever the accurate and counters. the work perfectly secure and perman ent, wherever the aqueduct encounters streams or rivers of any magnitude it is carried beneath thom either by deep pressure tunnels, or by steel and con-crete pipes. The most notable pressure tunnel will be that below the Huddon River In some respects this is the most interesting feature of the work, and we are informed by Mr Alfred D Flinn, Department Engineer of the Board of Water Supply, that the borings have revealed at groat depth a granite rock emigently suited to carry this great and important conduit. In addition to a vertical boring made from a barge at the center of the river, which has the center of the river, which mass reached adopted of 708 feet, two disponal borings have been made one from either shore of the river. That from the east ern shore descends at an angle of 44 degrees for a distance of 1407 feet, where it has reached a point 70 feet where it has reached a point 70 feet where it has reached a point 70 reet from the center of the river From the west shore, descending on an angle of 38 degrees, another boring has been driven for 1780 feet, which is now with driven for 1780 feet, which is now with in 180 feet of the cutter of the river. The vertical shafts are now being suit on either shows; they will be carried down to a depth of 1,000 feet below mean high-water level of the Hadson River of (Occolesces on page 300.)

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ment 1668.

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this point At that depth they will be connected by a horisontal tunnel. The aqueduct passes through the mountains, Hudson River at an elevation of 440-feet above tide level, and here vertical and horizontal shafts will connect with the 1,200-foot deep whaft at the immedi has 1,200-1001 ceep whant at the immedia-ate edge of the river, making a total dopth of 1,600 feet from the flow line to the lowest level of the siphon It is gratifying to realise that after the doubts and anxieties regarding the geological conditions affecting this work, its construction in solid granite has been its construction in solid granite has been assured it should be mentioned that the whole slybon will be fined through

out with concrete out with contrete

At Kensiro there is being built an
anxillary storage reservoir of about 40
billion gallons ultimate capacity, of
which about 20 billion gallons will be which about 20 billion galloan will be available at frow line level The elevation of the discharge will be 355 feet above mean tide. At Bearadale 4 miles sonth of Knaico, will be a large fitteration plant, and at Hillview, 6 miles to the south of this will be built another storage reser-voir with a raque ity of 390 million gal

voir with a rapacity of 930 million gai lons, the distingre being 295 feet above tide level

The kensico dam, which will be built a masonry structure 290 feet high and

1830 feet long
From the Hillylew reservoir water will be carried to the several boroughs of the city in a pressure tunnel excavated deep down in the rock beneath the boroughs of Broux and Mauhattan and under the Hariem and East Rivers to s point in the heart of Brooklyn, where it will be brought to the surface and conwill be brought to the surface and con-tinued in metal pipes, one branh lead ing north to the borough of Queens, and the other passing below the Narrows to Richmond at a point where the width is about 19,000 feet. This construction of this tunnel will confer the inestimable advantage that your at the lower and advantage that even at the lower and of

advantage that even at the lower and of Manhaitan the water will rise to a brighl of 280 feet above sea level, or say to about the top of a 20-story building The total cost of the work from and including Ashokan dam to the city line, all of which is now under contrast is \$15,004,870, and of this amount work to the value of \$10,000,000 has been com-pirted. The total cost of the whole wheme when all the watersheds have leen developed, will be \$163,000,000

IONINATION OF AIR

10FEATION OF AIR
(Confined from page 24)
The metal becoming tharged gives a
greatly charged shadow
The lons travel in a string electric
field at the rate of several ibousand feet
per second, and it is not the sir which tonveys like charge, although it is dragged along by the lons in the same manner as it is by a jet of water. This manner as it is by a jet of water. This can be demonstrated very easily by di-recting a blast of air at right angles to the path of the lons. Scarcely any defice-tion of the latter occurs. For instance, in Fig 7 is shown the image of an eb-onits rod and a glass tube produced in the manner already fescribed. The next the manner aiready foscribed. The next illustration repress to the same objects with a sirong blast of air thrown athwart the conrac of the lons. The effect of the blast is only shown issuing from the tube Just beyeast the rod (Otherwise the re-ault is oxactly the same as if there were no blast.

The experiments may be vari very wide limit, and an interesting variation is to use, instead of the shoults sheet, a plate of metal well insulated and connected to the other pole of the elecconnected to the other pole of the sloc-trical machine, instead of satthing the pole as nevirously decirbed. On the shoot of metal lay a piece of paper, and upon this sprinkle filings preferably a mixture of magnesium and black iron oxide Between the sheet and the dis-charge pole, interpose an object as b-fore, nach as the cross, and when the (Conchated on, page 251.)

971 610 (61)11 (61)46 (61)46 (61)46 (61)19 (61)19 (61)19

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(Concluded from page 2.0) electrical machine is set in action the filings will disappear from under the eboute cross, giving a well-defined image, as shown in Fig 9

as shown in Fig. 9
In the early part of this article it was
pointed out that the electric discharge
would not pass through perforated zinc
under the circumstances there, prevailing
But it can be made to do so 'To bring
about this result; place a plate of merial
about the tender place of the man
a way as so bring it opposits the dis
charge point in Fig. 12 Sepricise the
surface of the ebonite sheet with the
powdered red lead and suitpluty, and in
terpose an earth of silver of perforated
irno or an initial solve belowen the discharge point and the choulte. When the
charge point and the choulte. When the
firstly defined tunge of the perforation
of the sinc obstacle with the obtained upon
the ebonite sheet as shown in Fig. 11
If the plate condenser with its connected
also of tinfold, mentioned previously is
used, the passage of the ions through the
perforations may be assertized by
the sparks jumping across the narrow
conditions described the abortice fid do a:

the sparks jumping across the narrow gap. The explanation is last under the conditions described the electric fit of extends uninterruptedly from the point of discharge to the insulated metallic plate, so that the perforated sheet is in a perfectly neutral condition and scarcely in tercepts the ions. Several other striking and intercenting

iccrepts the ions. Several other striking and interesting mothods of lonising air can be carried out, such as by a finne whitched met als, electric sparita, and so on the air, such as by a finne whitched met als, electric sparita, and so on the control of the c

The experiments of Santa-Culton Devite and Caron apparently proved that the Oriental supplier owes its beautiful color to the presence of an institute quantity of chronium in a state of oxidation lower than that which corresponds to the sequioxide, it has not hitherto been found possible to reproduce the blue color with a gentle, nor yet to obtain by fusion in the approximation of the color o



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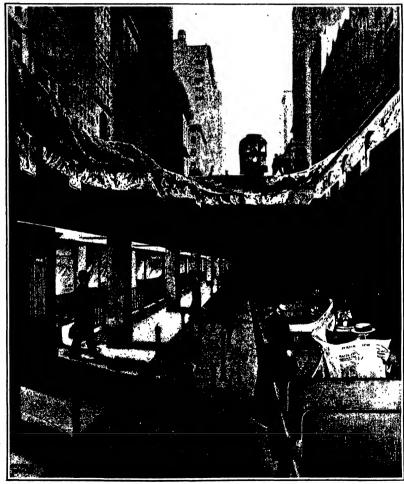


A POPULAR ILLUSTRATED WEEKLY OF THE WORLD'S PROGRESS

Vel. (II., No. 12.)

NEW YORK, MARCH 26, 1910

10 CP\F\ \ COP\.



The method of transportation by moring platform above can carry, according to the Public Service Commission, 72,500 people per hour at 12 miles per hour. The oddinaces of A miles this is a fast on travel by the present cambined express and local service. The express trains can carry 36,000 and the local trains 27,500 per hour. The necessive platforms more at 3, 0, 0, and 10 here be hour.

Scientific American

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NEW YORK, BATURDAY MARCH 26th, 1916

The follow is always—had to pressure for examination illustrated articles on asher to of this is noticeed. If this photographic are slong, the article short and the four authorities the contributions will receive approximate the contributions will receive approximate the contribution of the contribution o

THE PRESERVATION OF THE CITY HALL PARE. T is a positive inisfortune that the lack of a co-ordinated gian coupled with the astounding rapidity with which the city has been built up, to say nothing of a total wan of foresight on the part of the municipal authorities should have robbd the metropolis of the New World of the oppor-tunity to present those aggregations of magniform municipal hulidings, grouped about spacinus and care-fully laid-out plazas and public squares, which are one of the glories of the great cities of the Old World Buth publi spatis as we possess have been gradually encroached upon and their tubended visias have been close it and loo often positivity disfigured, by huttl-ings if no architectural leastly which have been run up apparently without any approviation and instainly with a total disressard of the architectural oppor

tunities thus presented and so rathlessly thrown away. Perhaps the best known of our public squares is City itali Park which early in the last century, was beautified by the erection of that gem of municipal architecture the City Hall a building which even at are not court in city limit a building while even at the most perfect place if work of its kind in New York if not in the whole in the latted States. For the greater part of a century this change building was marticulty the sole occupant of the nark und standng in the midst of its green haves and surror though not obscured by an indequate growth of tim-ber, this bimuttint structure tung remained as the dominating feature of what is certainty the most in terraiting and in some respects the most beautiful of our smaller clis marks

The first deserration of this spot occurred when the rearm assertantly in this spot occurred with the tri-sederal government erected at the spox of the tri-angle that unsightly alle which for several decades has done duty as the General Post Office, a building which not only entirely shuts out the charming view of (iv fiall and the Park which was lormerly obtain able from Broadway but constitutes in itself a monu ment to the total lack of refinement which mark public architecture of the day in which it was built.

And now it is proposed not unly to further encrosch spon the strendy restricted area of the park by build ing thereon a County Court House of colossal dimen but It is intinded, it you please structure immediately behind the City Hall, whose structure immediately behind the City Hall, whose just proportions and delicate beauty will be entirely dwarfed and rulined by the towering and widely over lapping façade of the building. Atthough it may be a palliation it is certainty not a justification of Mayor Osynor and the other city officials who favor this course, to state that they do so unwillingly and after a sincere endeavir to secure some other suitable site. For there is a possible though very costly, escape from the dilemma by means at the siternative which originated with the architects of this city and is receiving the indorsement of the leading artis tic municipat improvement, and historical societies to say outling of a thoroughly unanimous public press This proposal is that the city purchase the two block lying immediately in the north of the City Hall an place the new Court House upon the land so secured, the various departments being housed in the large offs, and other hulldings more more than and until auch time as the new Court House is ready for occu-panty. As the needs of the city demand it and tha funds become available the land so equired would be covered with other municipal buildings of a monumental character, and ultimately this group of hulldings, and the City Hall track with the present historic strucinre would form an important center with landscape and architectural effects of dignity and beauty that would be commensurate with the importance of a city which is destined ultimately to become in size wealth, and importance the leading city of the world, In giving our hearty indorsement to this proposal, we are not unmindful of the fact that New York city has now in contemplation public works on an enor-mous scale involving the expenditure of vast aums of mous scale involving the expenditure of vast anna of money But we also resists that in municipal as in other safare, conditions may occasionally arise in which sacrifice on the part of the present generation, large as it may appear at the time, may come to be required by operating as but a small price to pay for the lasting benefits conferred. The present crisis serving presents an opportunity of The present crisis serving presents an opportunity of

this yeary character

THE MAYER WAVAL REORGANIZATION TO HAVE A PAIR TRIAT.

N view of the diversity of opinion which N view of the diversity of opinion which was developed at the hearing of tha House Naval Committee that body followed, we think, the wheat course in falling to recommend any legislativa action until Secretary Nayara plan has been in operation for a sufficient length of time to ben in operation for a sufficient length of time to prove the extent of its practical utility. As to the wisdom of some of the changes which the Secretary has made, there can be no possible difference of opin-ium. The institution of a separate and independent lureau of Arrounting is one of the best reforms that have been introduced into the navy for many a decade. have been introduced into the navy for many a decade, and already at the Boston yard, where it has been for a considerable time in operation, the system has shown vory satisfactory results We are also heartly in sympathy with the pro-

posal of the Secretary to dispose by sale of those of our ulder vessels, which are so deficient in certain our unear vesses, which are so desirest in certain necessary qualifications of a modern warship as to rander the expenditure of a heavy aum of money upon them for repairs and reconstruction a very doubthip policy. A few years ugo England struck off the list and put up at autiton over one hundred of her warships, and there is no question that her navy was the better for this very drastic pruning out of and decayed material

Although the proposal to separate the work of the avy yard under the bread division of hill an terial is based upon logical grounds, and would nitimniety prove to have working advantages of a pro-tical character, we think that the proposal to separate the work is somewhat premature and this for the reason that we have not lo-day among the engineering corps, a body of men of sufficient shop e to qualify them for that oversight shops which is contemplated in Secretary Meyers pism if the institution of a separate department of muchinery includes as an indispensable corollary the training of a certain number of the navat engl neers for permanent shore duty as managers of the neers for permean it anose usey as managers of the steam engine-ering should of the navy lard the sun-cess of the plan would seem more tertain. In any case, we bettern that untit such a trained body in available it would be neighbored to continue both the steam engineering and construction shops under the management of the usval constructors Now that the Meyer plan is assured of a lengthy

period of (rist the country may rest assured that the whole of the naval service affected by the changes will co-operate in a inyal endeavor to give the nev plan such a perfectly fair trial as will serve to deter mine its practical utility. Therefore we greatly regret to see that a prominent New York daily paper has so far forgotten the dignity which attaches to its well deserved reputation, as to induige in a hitter personal attack on certain naval officers who have recently testified before the House Naval Committee, and that our confemporary has gone so far as to in-sinuate that because some of these officers were not in sympathy with certain features of Mr Meyers plan only proper course left for them to pursu tender their resignations

it is unjust and misleading for that journal to omit to state that these officers had no choice in the matter of giving testimony before the House Naval Committee, when once they had been sum Committee, when once they had been summoned be-fore that body, and that it was the whah of the Secretary that they should reply to the questions of the committee unhampered by any consideration of whether their views were or were not in harmonly

with his own So far from their frank expres ment with certain phases of the Secretary's plan showing in any sense a spirit of insubordination, we anowing in any sense a spirit of insuportalization, we rather take it to be evidence of a true moral con-age which places the highest interests of the navy above any consideration of a purely personal char-

Therefore to insinuate as does the New York Bun Therefore to instantate as does the New York with that from these and other gentlemen in the navy who may happen to disagree with certain parts of the Secretary's pian, it would be imposeible to se-cure proper co-operation during the coming months of trial, is to bettay a complete ignorance of that high professional spirit which pervades the United States Naval Service, and is nowhere more conspicuous than in that hard working and little appreciated body of officers, the Naval Constructors.

THE SCOTTISH SHIP CANAL.

THE SOTTIME SELF CLAFF.

HE STITCHES provements having reviewed the various projects for a ship canal through Scotland, whereby the Forth and the Cityde can be connected, have decided that so has a navie requirements are concerned, the most favorable rotte is that through Locks Lomond and Long, or as it is generally called, the "Low Lavel Rotte" Shut a canal the government states would unquestionship nosees some strategical value, and as they tionably possess some strategical value, and as they would financially sasies unde a scheme, the promoters of the enterprise are urged to push the matter forward in commercial interests. The government, however, stipulates that the canal shall have a foor width of 148 feet, a depth or value of 36 feet and locks 360 feet long by 110 feet wide at the entrance, will also shall be supposed to the supposed of the state of

although the mean level of the sea is practically the same on the Clyde and the Forth, the sevel at high water is not, so that a sea terel canal would p sharp tidal ourrents which would involve seriou in navigation

According to the designs which have already been prepared, the entrance to the canal from the North Sea would be a little distance north of Grangemouth, sativing inland in a northwestery direction, skir-ing Stirling on the south and running into the Forth valley which does not attain a higher elevation than 30 to 50 feet above sea level, then passing through the haunch of Ben Lomond into the valley of Em-This cut would be the heaviest on the wh route, the ridge attaining a maximum height of 260 feet above sea level But it is short Entering Loch Lomond, the waters of which are deep enough for the largest vessels attoat, the local is followed for 13 miles to Tarbet where another out is made through the nock of land, 1% miles wide separating Loch the neck of land, 1½ miles wide separating Loch Lounnud from Loch Long Tho latter would be en-tered at Arrochar and this loch, which has a very great lepth of water, is followed until the Firth of Clyde is roached opposite the Cloch Lighthouse The locks would be placed at either and of the canal that on the Clyde to lift the vessel to the level of the water in lock Lemond which is 22 feet above the mean level of the sea and the other at Arrochar regain the sea level in Loch Long

The total length of auch a canal would be 51 nau-tical miles of which 30 miles would be in canal and the other 21 miles in the open waters of Loch Loone of 191 feet near Stirling another of 285 feet, the head of the botth valley, and due of 142 seet letween Tarbet and Arrochar These cuts though The vessels will have to be deen are very whort lifted at the Forth end of the canal 13 feet at high water and 31 feet at low water, at Arrochar the lift would be 17 and 27 feet respectively in addition a regulating lock would be formed at the head of the odrick valicy to be used when Loch Lomond is in high flood,

high flood, burlier advantages of this route are the avoid-ance of river deviations only comparatively small procise being occupatered, which could be easily synthoned across the canal. Only one deviation would be necessary that of the Endrick which after all la only a stream Again, the minimum of interference will be militored will be offered. No swing bridges will be necessary and it will be possible for ves to proceed without shortoning their meets The harpest curve will have a radius of two miles. The construction of the canal will entail the excavation of 170 000,000 cubic yards of material, and its cost, t the Admiralty requirements, would approxi-

mate \$120,000,000 Work would occupy seven years Apart from its strategical value, the canal would Apar from its strategical value, the canal would have distinct attractions for commercial traffic it will offer a shorter route between America and Europe, and will avoid the dangerous passage of the Pentiand Firth The extent of this "North About" traffic as it is called, including the coastal About: Traine as it is called, including the coastal traffic, is considerable, and the saving of rows 100 to 500 miles in the see journey of his transactionic vasses, according to the situation of the European port would be an important consideration. The agregate of this traffic which would use the canal is 10,734 800 tone per annum, and at an average rate of 21 to 10,734 800 tone per annum, and at an average rate of the second cried on a saving law. 10,724 NOS tons per annum, and at an average rate of 27½, cents per ton this would yield an annual revenue of about \$4,031,800, which after deducting \$300,000 as the annual cost of maintenance, etc would yield about 3 per cent on the capital for an Admiratly cental. The actions is being actively pushed forward, and so soon as some idea of what the government would be prepared to do financially is obtained, no difficulty will be experienced in securing the se somer financial support to construct the

Scientific American

AERONAUTICS.

25. Adsc, the Franchman said to have flown about 1,000 feet in 1897 with his steam-propalled monoplans, the "Avion," has recently been decorated with the red ribbon of the L-gion of Honor. His machino is said to have embodied the wingwarping principle since patented by the Wrights.

Proceedings have been begun in Frunce to invalidate the Wright petent No. 145,118, of Marco 24, 1984, on the ground that the patent was not worked in France within three years, as must be done according to the statute. In asserting for antiquations and No. 193 of Mathew West Boulen, greated in 1984, whelp movides morable wing tips or "discreas" for the purpose of transverse stability in 1870 Rich and Harrie, souther Engishmen, took out a patent (No. 1469) for maintening transverse stability of means of revolving wing tips coveraged by a weight

The second annual combined seronantic and motor at show opened in Olympia, Indone (Espitalend) on March 11th Besides numerous small models, forty of March 11th Besides numerous small models, forty acroplanes and halloons were shown in addition to the regular French models of Wright, Biefrol, Farman and Santos Dumont, a number of British built duplicates were shown by weil-known firms, as the Humber Company, for example in addition to these there were a number of new sert-planes built by English inventors Interest in avia tion is very strong in England at present, and several line aviation ments are planned for the coming and

In preparing for a re-hearing of his car 19th inst, Glenn Curtiss has experimented to see how much resistance can be interposed at the ends of the planes of his hiplane without causing it to sworve d small vertical fine 1x2 feet in size, and four that these could be set at right angles to the line of flight for a few seconds without causing the sero plane to swerve from a straight path and without moving the vertical rudder. As the resistance of the balancing planes which Curties uses is far less than is obtained in the manner just described, there can be no turning tendency produced by them, and hence no use of the vertical rudder in coulu Mr Curtiss has also flown with the vertical rudder tied and with it loose, showing that a move ment of this rudder is not required. We also learn that the Autoinette monoplane has been flow with the vortical rudder left off. With these practical demonstrations of flight without the use of the Wrights' patented combination, there seems to be little doubt that any infringement suits they may institute will be successfully defended

On Sainteday March 12th, Aviator Lovils Paulban made only a sixon straight limit eligibat 600 oct. at the Jamaies race track. The strong wind of Smilles an hour velocity, and the few spectators were the principal reasons. On Sunday, however, several thousand people journeyed to the track, many of them in automobiles, and despiles a wind nearly as strong as their of the day before they were not distinct the strong strong as the first of the size o

On March is and 3nd Mr Herr Yearman made of March is and 3nd Mr Herr Yearman made of Mr Herr Yearman made of Mr Herr Yearman made of Mr Herr Yearman Mr Herr Y

ELECTRICITY

ha September of last your the Boston and Maine Railroad established a telephone train dispatching system on the line between Boston and Fitchburg. Mass This system proved so estimatedry that the railroad, is now about to equily two new divisions with triesphones One of the divisions consists of a belimic line, from Concord to Woodsville, N H, and the other of a 70-mile line, from Concord to White River Junction, Vt.

In a lockure before the Engineering Society at Birmingham, Sir Otiver Lodge discussed the question of protection from tightning. He stated that the problem consisted in finding the best method of dissipating the enormous energy of the flash, but that twan out wise to get rid of the energy too quickly A thin from wire is considered the best lightning conductor from the electrical point of view, but it is atmost impossible to protect a building from tight and the problem of the provided in a metal man guiless it is completely enveloped in a metal where provided with a renductor reaching up to the tallets part of the building.

Experiments made with ultra violet light show that it is more effective for sterilizing flouble show that it is more enecute for attrining requires than osone. The ultra-violet light is produced by means of moreory vapor lamps quarks tubes being used instead of glass tubes, which are placed in direct contact with the water to be nurified. A French investigator, M. Victor Henri, has found that the bacterioldel action varies growth with the distance of the lamp from the bacteria. With a Cooper Hewit ismp of 110 volts an exposure of 300 seconds at a distance of 60 centimeters was required in order to kill the bacilius coli At a distance of 40 centimel ers an exposure of 180 seconds was sufficionat 20 centimeters 20 seconds. The temperat The temperature auat 20 centinuters 20 seconds. The temperature ap-peared to have little if any, effect for the microbes were destroyed even when the liquid which contained them was frozen in treating opaque liquids such as milk it was necessary to spread the liquid out in n thin isyer For milk the maximum thickness of one inch Another investigator produces the ultra fied atmosphere of carbon monoxide, carbon suinbureted bydrogen or sulphurous acid

An interesting description of the rural telephone lines in the Ozarka was published in a recent num-ber of the Electrical Review and Western Electrician Every farmer in this region, no matter how poor he is has a telephone. The telephone lines have been installed by amateurs and every variety of telephone Owing to fe ar of lightning the connection from the pole line to the house with is ending the ends of the wires and housing her When a thunder storm approaches then: together ection is unbooked and it frequently hap pens that the owner forgets to re-establish or tion with the main line after the storm. The lines are all grounded, making it very difficult for one call another Fifty telep cunsidered a light load The times are supported on auch poles as can be easily obtained, which are sel prevent them from teaning at all angles. Tre are also used to support the lines and the branch mes eddom cut away to clear the wires. However the subscribers appear to be satisfied if only their line "talks." The subscribers usually combine to put up a switchboard in the nearest town and pay some

A very interesting method of electroplating has seen developed in England. The metal that is to be uposited is mixed in powdered form with other aub-snows and it is marely necessary to wet the powder and rub it on the surface that is to be plated. The other ingredients are an electro-positive metal, such as sine or magnesium, an inert substance such as chalk, and a sait which when wet serves as an electrolyte The following description of the process is given by the author 'The electro-positive metal constitutes the anode and the object treated the cathode, and as electro-positive metal it makes innumerable contacts with the cathode surface and acts as so many minut-These innumerable minute anodes graduelly dissolvs, and in dissolving set up in the ilquid little tocal circulations of electric current. The circuits are so excessively small, so exceedingly near together, and so numerous that they cannot be separately obd, and the surface of the metal be seat of innumerable concomitant voltaic and electro lytic actions. Thus the potential or stored up energy of the sier entary substances in the powder is con verted into electric current, and as the leave the liquid they throw down from the metallic sait is solution a thick film on the cathode, and it becomes plated over with a deposit'

ACIENCE

Prof. Lowell announces that he has discovered a new canai a thousand miles in length on Mars. The canal developed between May and September last

It is stated that many of the library newspapers, printed twenty years ago are disintegrating because our modern wood pulp paper is not permanent.

The collection of Indian contumes weapons and uteralls brought together by E.W. Lendors of Phila delphia and valued at \$40,000, has been bought by J. Pierpont Morgan and given to the American Museum of Natural History.

The astronomical clock at Hampton Court Palace has been removed for repair and repainting for the first lime for nearly thirty years. The clock, which was the first of its should in Stagtand was made for livery VIII in 1940. In 1850, it was invasify from a shed at the balace where it had lain for nearly half a century, and by order of the Office of Works was re-eved in the position which it has short or cupied in the courtry and of the pudder.

The count discovered by Daniel in December in not the same as one discovered in 1887, for which a period of about forty two years had been found than le's come has been found in being to the Jupiter family of concels having a period of about six and a half years. There are now over thirty of these and four or five of hom pass through peribelion every year, but they are in many cases so fullet as to elude observation sitegeliser.

W W Goblasta has discovered that one of the himmericans of the milky link disched himmericans in the milky link disched himmericans (Photimus pyralis) exudes when touched exhibits an intrase bits fluorescene two properties of the milk a suppose the link as a possible tray. The linescence apactron is very bright and continuous from 190₂₀ to 10 link per bright and continuous from 190₂₀ to 10 link per light which have lengths are measured (say, the unit in which wave lengths are measured that the say of the country of the properties of the link per link at the link per link at link per link at 100 links is or aroung recovered and this spectrum extended from 510₂₀ to 570₂₀. Hence the two spectra are mutually complementary

In the northern part of Archangel, which is the most northerly government of European Russia a farm for the breeding of Kameshalks ofters blue focces, sables, marriera, and other valuable fur bearing animals is being established by German capitals. The soil and climate of this district are exactly sailed to the naimals and the annual result barge is only about 5 cents per acre, no that the veniors appears very promising at fine glainer. In the other hand, a large fulfall online in required. The farm with sheet I ron which has cost \$67.000, but the bury rowing propensities of the foces and reducte will probably make it messans; to extend this barrier underground, at a large additional exp new

P Soddy finds that the groats of raidium proceeds recording to the square, of the time. On the measurables that no other intermediate bodies inference the period of the direct parent of raidium is 17 500 years. The amount of raidium present in the last prequest entitled in the state of the period of the direct parent of required, the suggests the existence of at beast one new product. Uranium Ar historication between uranium X and he parent of raidium with a prod of the order of one year if a concluded that his would not appreciably after the production of raidium according to the square of the time over the product observations have been made, but it would within the calculations of the product of the production of raidium according to the production of the production of raidium according to the square of the production of the

A German hird family has made a series of experi ments for the purpose of determining the vitality eggs in different stages of locubation. (to the fi day of incubation five canury birds eggs were taken from the nest, marked with numbers and replaced in the nest, one by one at half hour intertals. This experiment was repeated ten times with as many clutches of eggs. As a rule the first three eggs red batched normally and the two others to hatch Henre II may be inferred that the average ongevity of a canary birds eggs taken from the next on the fifth day of incubation is 15, hours in the e way the longevity was found to increase to 2 or 21/2 hours on the seventh day and 31-2 to 4 hours on the ninth day of fucubation It was discovered by accident that eggs in a very advanced stage of incu bation can endure very much longer periods of ro moval from the nest. Two eggs, purchased as picy eggs, in the course of an excursion, were or's eggs, in the course of an excursion, were stowed in a basket, brought home and forgotten O the evening of the following day a faint "beep" recalled the existence of the eggs and it was found that a young snipe had issued from one of them ond anipe soon made its appearance but fived only an hour Hence it appears that the vitality of partly hatched eggs depends on the size of the bird as well as on the stage of incubation,

An Account of a Trip in the Largest Balloon Ever Constructed

A BALLOON TRIP OF FORTY YEARS AGO.

It is doubtful whether the sensation of traveling in It is doubtful whether the sensation of traveling in an airship has ever been better described than was done forty nine years ago last Jun by Garrick Mai-lory and published in the Tritatel-pila Inquirer, Juno 30th 1860 after a voyage in the largest airship that had ver been constructed up to that time Mr. Mailory was a genis man of education and fine

Mr. Mallory was a genish man of education and fine descriptive insist and lairs communished a brigade of savairy during the civil war. Prof. T. B. C. Laws, the aromatic floating in the communished communished and the communished communished to the communished communishe

Accordingly, when on the ground, we

we re beset with gratuitous advice from self constituted professors and almospheric voyagers to the effect that it was madeess to risk the untried experiment, and to our friends we were ridiculed, threatened, joied, bribed, and wept over by turns

"So we held a council of war with ourselves in ated cool reason and positively could not see why so increase of capacity in a balloon must necessarily diminish its efficiency, or that a greater range in th amount of gas to be evolved on the orrasion, and in the number of sand bags to be retained or thrown away according to the object of ascent or descent, should destroy control over the element to be navi

"The few uncut ropes are held by strong arms, the enterprising workman who seems to desire an ascent on the edge of the basket is induced to get down and on the edge of the manet is induced to get down and put a bag of sand in his place, the other two gentlemen who determine at the eleventh hour to acquire serial honors scramble in when the awaying has begun, the 'last dying speech and confession' has been made, all "Mat dying speech and contession" has been made, all hands let go—and we are oil! We don't believe it, bowever, in the slightest degree "There is no motion porceptible, and we correleve are entirely stationary Something to be sure is the matter with the field it has dropped Perhaps that is the reason why the crowd down below there is making such a noise. They



LOWE'S DIRIGIBLE BALLOON.

are frightened, most probably. To be sure, they have some reason, for it is a rather alarming occurrence for the solid earth to fail down in that way, especially when all nature is so caim, and the sun shines so bap-plly, and our car is so nice and fixed. So we feel budly about our unfortunate fellow beings who are moseizes us that we have actually begun the great ascent, and we forthwith begin to wave the flags and hurrah and jump No, we don't jump, for there isn't room, but we would if we could. The mittee down below give cheer after cheer responsive, and run futilely in

give cheer after cheer responsive, and run futilely in our course, and we fiy away.

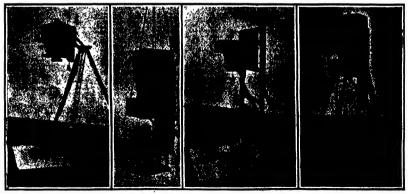
"Although nobling could have been saster than to have risen immediately to a great height, yet as the lower brases was northerly and light, we purpossly re-mained in it, as thereby a deliberate view of the city and its environs was presented that could not be hoped for once in a thousand times. We had precisely the day, the hour, the ourseat, and, above all, the balloon day, the hour, the ourreat, and, above all, the balloon for a hird's eye impaction of Philadelphia, so sailed calmiy on, slient, and ravished with octasay. At the allitude of three thousand feet we look down fundly on Gray's Perry, Darby, and the park, scenes of our coquetrian pleasures, and then turn to the sparse houses of soni rural Moyamentins, pleturesquely initiod in green takes and foliage Next we gittle on over the great city, seeming to the salesy in that not nammer evening, with naver a breath to disturb its happy rest, save the vagus murmur of life which steals happy rest, awe the wagus murmur of life which steads spward toward in, life the distant hum of invisible insects. We are higher now, and to the naked sys-vata hisliding life the Continental are distinguished chiefly by their known position, but as we pass along, the streets radiation on all sides with mathematical ex-actness, bordered with faint green lines of foliagns, and the spires point up at us with the beams of the and the spires point up at us with the beams of the sun abiling from their whiteness until the only one and the apires point up at on with the beams of the sun shining from that whiteness until they only can be likened to the hear-freat appearing on a window in winter Far away Girard College in discerned in the distance as an antilli of marbie dust, and Fairmount is found in a fairy tondstool, with the Schuylitil cur-ing close to it like a silver thread dropped, perhaps, ing close to it ince a silver thread dropped, perhaps, from the robes of Titania herself But it is perfectly in valu to attempt any description of this most ex-quisite scene, which naught but the colors of the most gifted could pretent to convey to any who have not gifted could pretend to convey to any who have not beheld it Indeed, it was all to us but a seeming ple-ture seen in an earaptured vision. There was no reality about it. We were real, and the car, but every-(Continued on page 200)

VERTICAL PHOTOGRAPHY

BY CHARLES MONROE MANSFIELD

In recording scientific material, whether plants or in recorning scientisc macerial, westers plants of their fruits, or any peruliar material of which a rec-ord in picture is valuable, the exact size is aiways desirable. Various apparatus have been constructed to support the camera and hold the subjects, but the scale servel lies in the focus of the lens. Any sub-ject placed twice the focal length of the lens from tha iens, and the kna twice its focal length from the focal plane, will give a picture natural in size. For example, a nine-inch focus iens placed eighteen inches from the subject and the focal plane the same distance from the lens will give a natural size image in focus on the ground glass without further adjusting

Nearly all actual size work is done vertically This Nearly an accusa sizes work in one vertically 'time gives the operator the privilege of maniputating his 'under ground during the exposure without inte-foring with the subject. The object to be photo-graphed is usually placed on a glass support, which may be either plain or ground, and the back or under (Concluded on page 287)



AN INTERNAL COMBUSTION WATER PUMP

THE INGENIOUS INVENTION OF H. A. HUMPHREY

wisempread interest has been aroused in European engineering circles in a new type of pump that has been even by a well-known Euglish engineer, Mr H. A. Humphrey, M. Inst, C. E. It is

hased upon an an tirely new principle, and is a revolution-ary departure from existing practice, the nevelty of the denovelty or the us-sign compelling as much attention as ency and econ

The pump is mental principle of internal explosion, but does away with all the usual work-ing parts of a gas engine, such as the piston, connecting rod, crankshaft, fly rod, crankshaft, my wheel, two-to-one gear cams and bear-ings. There are no moving parts what ever except the sim-

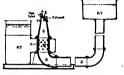


d close automati and close automati-cally, due to pressure changes, and the use of a fix-wheel is not necessary because a column of water, forming part of the water pumped, acts as a reciprocating flywheel. The water column, which also acts as a piston, has four unequal atrokes, such as theory requires when expansion is carried to atmospheric pressure. These strokes comprise long strokes during combustion and expansion as well as during exhaust, a shorter stroke during suction, and a still shorter stroke during compression. There is no valve across the discharge pipe at any point, so that the water has a perfectly free passage from the explosion chamber to the high level tank.

The explosive mixture of gas and air is ignited, as in the ordinary internal-combustion engine, and in contact with one end of a coinmn of water which ful fills the dual function of piston and fiveheed and Bills the disk runcion of piston and nywhere and mores so as to draw in a fresh combustible charge, to compress this charge previous to explosion, to parmit expansion to be carried to atmospheric pre-sure, and finally to exhaust the products of combus-tion. All these movements are brought about and con trolled by changes in the momentum, which occur naturally in the commn of water itself

In order to explain the cycle of operations in a ump o the simplest type, a reference to the accom pump o. the simplest type, a reference to the accumpant of signs with 15 from useful. The pump proper is built up from three main castings. There is the combation chamber ℓ , the water varie shamber W, and the bead β , which connects the pump to the discharge pipe D, leading to the elevated tank β . T The suction tank β . T is extended to embrace that valve-box chamber, as shown, to that there is free access of water to all the water valves V. The last spining water M and held on their satting by light optings. In the top of the cathant valve K arranged between these two valves is a simple interlocking device, so that when valve is a simple interlocking device, so that when valve A has opened and closed it locks itself shut, and re-leases valve B, and when valvo E has opened and closed it locks itself shut and releases valve A. Con sequently, each time suction occurs in the chamber valves open in turn.

For the purpose of demonstration, suppose a gaseous charge is compressed in the top of the combustion chamber C, and is ignited in the usual manner by the sparking plug, which projects through the top or or head of the combustion chamber. All the All the valve are shut at the instant the charge is exploded, and



SECTIONAL VIEW OF INTERNAL COMBUSTION PUMP.

sure resulting from the expan the increase in pressure resulting from the expanded gases forces the water downward in the pump, and sate the whole column of water in the bend B and dis-charge pipe D in motion. The column of water attains thetic energy while work is being done upon it by attentic chergy write work is being done upon it up the expanding gases, so that when those gases finally expand to atmospheric pressure, the column of water may be moving, say, 8 feet per second. The motion

RAPID TRANSIT BY BELT CONVEYOR

A PROPOSED AMPLIFICATION OF NEW YORK'S SUBWAY

The method of rapid transit by means of continu-The method or rapid transit by means or contun-ously moving endiess platforms has never as yet re-ceived the attention which its unquestionable advan-tages deserve, for, within certain limits of speed, it possesses a capacity for carrying passengers which is taged deserve, for, within certain limits of speed, it so processes a capacity for carrying passengers which is so far beyond that of any existing system as to place in a class by testif. That the system has not been put into practical application in the solution of those problems of congested city trained for which it is so problems of congested city training, which, even in the strength of the control of t

who was responsible for the electrical equipment of the Elevated Raliroads and the New York Subway system, interest in the proposed moving plat-form has been recently revived by the recommendation of the Board of Estite of this city that a moving plat form be installed in a subway extendtorm be installed in a superly extended in a superly extended from the limit to the Hudson River below Thirty-fourth Struck; and on the front page of the present issue is a sectional illustration, which shows the general character of the construction both of the sub-

smears character of the construction both of the sub-way and of the moving pistorine itself.

In those branches of our industries, for the co-nonical operation of which it is sheduistly necessary that material be conveyed from place to place at a nearthnum speed eagl with a mintum jose; it has been fessel that there is no eyeten of transpertation valled so perfectly ristillic these conditions as the best caveyor. Particularly is this tree where a great oblict of material, consisting of neces or less finely divided units, such as could twice eye wheel, here to be narried in great quantities with a riskly happen.

ruption as possible and without any manipulation by hand In this system, an endless beit moves continu-ously in a given direction, and facilities are provided for loading the material on the belt at any desired point and for unloading it therefrom at any desired

oint of delivery The moving platform is nothing more nor less than a huge beit conveyor, in which the material to be con veyed consists of the teeming millions which constitute the passenger traffic of a great city, with pro-vision for loading the passengers at any point through-out the length of the platform and unloading them out the tength of the platform and unloading them while the latter is in motion. The train consists of short jointed platforms, coupled together and form-ing an endless chain which is kept in continuous motion. This platform is provided with transverse

View of the method of driving the platforms by means of stationary electric motors and differential rubber-tired wheels. BAPID TRANSIT BY BELT CONVEYOR.

seats, and if travels at a continuous uniform speed of twelve miles per hour For transferring the pas-senger from the fixed station platforms to the seated platforms, there are introduced between them three narrow "loading platforms" which more at differen-tial speeds. The first of these adjoining the station platform moves at three miles per hour, the next at sait, and the next at nine miles per hour. The passen gar who wishes to board the train, faces the direc-tion in which it is moving, stope cuto the three-mile-per-hour platform, and, crossing the other two suc-sequively, takes his sent. The resease of the senlator or moving stairway, of which many are now in operation throughout the country, removes any doubt of passengers being able after a little practice to ac-commodate hemselves to the speed of three miles an

hour involved in boarding the train
The advantages of the arrangement as summed up
by the Chiof Engineer of the Public Service Commis-

on are as follows

1 A vastly increased capacity, and scats for all

ngers. There is no delay incurred by waiting for trains at stations, as the train is always then stantly moving

3 Passengers may board or leave the train at any

of a mile spart, as on the present Suhway, they may be placed at overy cross street, or in-deed at mny intermediate point, and

the construction may take the form of a continuous arrade

in its general construction the tun net would be similar to those built for the ordinary Rubway traffic it is prothroughout its length, with store win dows at basement level, and contious promenades between them and the barrier separating them from the Subway platforms At each street cross-ing, and if it be desired at one or more points between them ticket booths and turnstiles will be installed an arrangement which would permit ngers to board the curs practi passengers to soard the curs practically at any desired point throughout the length of the subway.

The arrangements for driving the platform by electrical power are as follows:

iows Extending longitudinally neath each platform is a pair of

beams, the upper flauges of which are riveted to the bottom of the piatform, while the lower flauges serve to support the weight of the piatform upon pairs of wheels, which are carried upon transverse shafts mounted at intervals of 2 feet 8 inches, upon concrete piers, as shown in the engraving Between cuth pair of longitudinal i beams is carried a pair of horizontal or iongitudinal rowants is carried a pair of normanical guide wheels which engage a guide rail that serves to keep the platform in proper sligment At every 76 feet, 10-horse-power motors are mounted on the floor of the subway, and are connected by a chain drive

COMPRHEED FACTS ABOUT HALLEY'S COMET.

A few facts presented in a condensed form may possibly interest the readers of the SUPYTHE AMERICAN who wish to follow the course of Halley's come in the heaving during its present appear.

of Yerks otherwisery Prof. attenue.

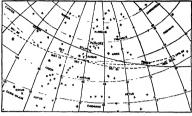
of Yerks otherwisery estimated the fall
to be 14 000 flots in long Jose to fall
will be at least that long seems to tall
will be at least that long and probable
will be at least that long and probable
to perfect the profits of the perfect of the profits of the perfect of the perfect

The comet first crossed the earth a orbit about March 10th at a point where the earth will arrive at the mid die of next Ortober, but far above where the earth will be so to speak for it will be some 10,000,000 miles above the pilene of the ediptie! in April the context will camerge from behind the sun, and will become visible to the naked oye in the eastern sky before sutries.

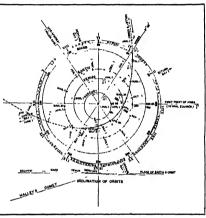
On April 20th, when the connet will swing pround the sun, it will be 57 000,000 miles away from the sun it will be 57 000,000 miles away from the sun it will be 57 000,000 miles away from the sun it would be supported by the sun of the sun of

deg splender After that it will speed away from the solar system. The last glimpse of it with the naked eye will be obtained probably at the end of June. It

eye will be obtained probably at the end of June. It will not respect for evernfy for years Halley's comet is notoworthy because it was tho first comet for which an orbit was plotted and a time table calculated. It has a history more or less identined with the history of human thought and civilisation. The superstitions dread with which it was regarded in moderval and ancient times swayed many a monarch. It was instrumental in forming the politics of Leuis in Personners in 837, it biased in the



THE APPARENT PATH OF HALLEY'S COMET THROUGH THE REAVERS



HALLEY'S COMET AND THE BARTH.

these mit the cellule show positions of planets and comet every (0 days. Positions for January 1st 1991, at shown than "Jan, 1." The executing modes, or points where the oriest inder cross the etiglist, are above there 2. Destate perfection of the oriest neithers the part below the exigitor. The content of the execution of the execution of the orient neither part and the exigitor. The the right assessment are indicated in horse, The Irelination Diagram there: the Pright assessment are indicated in horse, The Irelination Diagram there.

> aky when the Turks threatened to overrun Enrope in 1466, and when the Reformation was at its height in 1531 It struck terror to the Baxons under Harold in 1066, when they were conquered by William of Normandy This foar of the middle ages was dispelled only when Halley made his great prediction in 1642 that the counts would return in 1753, a predic

tion which was verified after the great astronomer was in his grave

A comet which has reappeared regularly for over two thousand years must be composed of fairly enduring stuff Just what its composition may be, the

Just what its composition may be, and present reappearance will for the first time enable us to tell, for in 1635 the spectroscope was not invented, nor astronomical photography perfected

THE NEW ARGESTISS DESADEOUGETS.

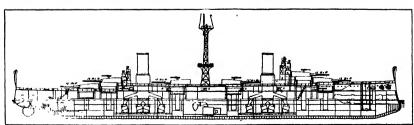
Tanks to two contemporaries devoted from the contemporaries devoted the and The Standard of Beened Agree, we are in a position to publish some quite complete information regarding the row low fracednoughts, contracts for which have recently been secured by the Fore River Company Comparison will naturally be instituted between them and our latest dreadnoughts, the "Wronting" and "Oklahoms." They are 30 feet about a feet isse draft, and their displacement is 1,500 tons greater The ships are as fruity protected, and if or

pectations are halfilled, they will have we have greater speed, a result to which their greater length and finer lines will largely contribute The armor plan appears to be about the same, with the addition, however, of a certain amount of special profession against underwater attack. Because of the emphasisment of the two central turnels disposally, the endoin control turnels disposally, the endoin control turnels adjusted the same would be a superior to the control turnels will be obtained in the control turnels and the control turnels and the control turnels are controlled in the control turnels are controlled in the controlled in t

course investe disposingly, as shown in the both of the course of the co

and ammunition rooms for the central pair of turrets. Fore and aft of these are the two separate sets of boller-room compartments, while fore and aft of these compartments, again, are the turret hoists and ammunition rooms for the forward and after pairs of turrets.

The separation of the one military mast from the neighborhood of the forward unokestack, bridges, conning tower and forward turrets is advantageous, in-



Longila, Si fiel. Beam, 10 for Bioplacement, Si fit son. Boil and Turret Armen, 11 index, Armenings; Today 13-ind., twin blank and industry and Excellent Control of the Two Armenings; Desarbourns.

Scientific American



asmuch as it is thereby removed from the favorite aiming point of modern gunnery, which is a little forward of the base of the foremast

The position of the 6-incb battery, with a protection of 8 inches of armor below and 6 inches in front tion of 8 inches of armor below and 8 inches in front of it, must be considered very satisfactory, although the protection is not equal to the 9 inches afforded to the 5-inch bettery on our latest ships. Except also is the protection of the smokestack to a height skip of 15 feet above the spar deck by a special stole 134 inch in thickness. The following particulars taken from The Standard of Bosnos Ayres, will be of intovest The main armor bett will except for 250 feet in the center, and 4 feet

9 inches above and 2 feet 4 inches under the normal water line, the uniform thickness being 12 inches The armored band will extend 75 feet toward noon and bow to the barbettes, but with the the kness of 10 inches only Above the principal belt of armor for the whole only Above the principal best of armor for the whole length of 400 feet there will be armor of 9 inches in the lower part and 8 inches in the upper part to the beight of the main deck. The bow and poop will also be protected by armor of 6 and 4 inches respectively On the main deck there will be a casemate with armor of 6 inches, in which the 6 inch guns will be placed. The bases of the chimnoys will be protected to 15 feet from the deck with a special steel plate 11/2 inch thick. The total wright of the armor harbeties inch thick. The told wight of the armor, parbettes, turrets etc. will be 7,000 tolus. The bottom of the ship will be protected against submarine mines with 600 tons of nickel steel. The turbine engines will be in three separate and independent compartments, and in three separate and independent compartments, and the boliers will be in six compariments, divided into two groups. The capacity of the coal bunkers in 4,600 tons and there will be tanks for 660 tons of potro-leum. The turblics will develop 39 500 horse-power with 25 millimeters of pressure of air in the boilers This, with a dispiscement of 27 500 tons, will give speed of 2.1% miles an hour for eight successive hours With this speed the radius of action will be 3,600 miles, at a speed of 15 miles the radius will be 7,200 and with it miles an hour 10,100 miles. The cost of each ship will be \$11,000,000

THE SCIENTIFIC AMERICAN FLYING MACRINE

COMMITTIONS FOR 1910

The Scientific American Tropby for heavier-than-air flying machines was offered by the Scientific American for annual competition under the rules and regulations formulated and promulgated by the Acro Club of America in 1907

Club of America in 1907
The first trial for this cup was held at Hammondsport, N Y, on July 4th 1908, by the Aerial Experiment Association of Hammondeport N Y The minmum distance to be covered was one kilometer (3,280 feet) The trophy for 1908 was won by Glenn H Curtiss in the "June Bug," he having made a flight of 5,090 feet. This was the first official public flight for a record made in the United States

The trophy was also won for the year 1909 by Glenn H Curtiss, who on July 17th fulfilled the new conditions of the competition for that year by cover ing a minimum distance of 25 kilometers. The actual distance covered was 25 002 miles in 52 minutes 30

distance covered was 30002 miles in 02 minutes as seconds, which was considerably in excess of the mini mum distance required lioth of these trials were made under the super-vision of the Contest Committee of the Aero Cinh of America

America.

In accordance with the deed of gift which provides that the conditions for each contest for this tropby shall be made progressive in their severity of test in conformity with the progress of serial nav-gation, the conditions to be fulfilled by the next per-son entitled to have his name placed on the trophy shall be a flight of not less than 40 miles across coun-iry The contest for 1910 must be held within the United States.

RULES COVERNING COMPETITIONS FOR THE SCIENTIFIC

AMERICAN TROPILY POR 1910

Acquires recover year less than the club and not of the members thereof, except in the event that any one person shall win the tropby three times, in which case it is to become his personal property. Blood the trophy to won by the regresentative of some foreign club amiliated with the Aero Cicle of America through combenship in the interpational Aeronautic Federation, it shall be held in the castoff of such club, but it shall be subject to competition

under the same terms and conditions as if it were atill held by the Aaro Club of America. Should the holding club, for any reason, be disbanded, the custody of the trophy shall revert to the Aero Club of America. Should a contest or trial under the rules not be held

Should a contest or trial ander the rules not be held within a year from the date on which a foreign com-puting macbine shall have won the trophy, the foreign acro club having possession of the cup shall give up its custody of the same and shall return the cup to the Acro Club of America, in order that the completition or trial for that year may be held in the United States of America

The conditions under which the competitive and trials shall be made shall be determined by the and trials shall be made shall be determined by the Contest Committee of the Aero Cliub of America and such conditions shall be made progressive in their severity of test, as far as possible, in order to foster and develop the progress of the art of serial savigs

All heavier-than-air machines of any type v ever (acroplanes helicopters, ornithopters, etc.) shall be entitled to compete for the trophy but all machines carrying a balloon or gas-containing envelope for pur poses of support are excluded from the competition

In order to compete for this prize the con testant should file with the Aero Club of America a formal entry, addressed to the club at its headquar-ters in New York, declaring his intention to compete for the trophy Whether the trial is to be made at



THE SCIENTIFIC AMERICAN PLYING MACHINE TROPHY.

a recognized aeroplane meeting or at a special trial, the contestant should indicate the date upon which he seeks to make a flight. He must also deposit the amount of the fare from New York to the place of

A reasonable time must be allowed for the repre-A reasonate time must be allowed for the repre-sentative of the cinb to reach the place where the flight is to be held if the trial is lo be made within 25 miles of New York city, the amount of the fare will be defrayed by the cith In case the Contest Committee find that the place of trial is too far discial present, the contestant may be required to hold the trial at some convenient place mutually to be agreed upon

agreed upon

IV The person or committee having charac of the
test or trial shall make careful meannements of the
distance covered by the flight, and shall prepare a
written report of the test or trial, which shall be
delivered to the Contest Committee of the Aero Club
of America, and in such report abail state fully
wither in bis quinton the macchine can be handied whather in his opinion the macunic can be manuful with safety, and, as far as possible, he shall determine the speed attained during the flight. He shall also take into consideration the question of stability and case of coursel, and he shall state in his report weather and wind conditions.

The flights will be made in as calm weather as

possible, but the contest committee or its representa-tive will at its discretion order the flight to begin at any time it sees fit, provided the velocity of the wind does not exceed twenty niles an hour. The ma chine may start by running on the ground or upon a track under its own power, but no special launching device will be permitted. There is no requirement as

Complete specifications of the competing r chine, giving weight, appropring surface and power of engines together with a description of the best trial of the machine, shall be forwarded to the Con-test Committee at or before the time of making entry

The trophy shall be awarded for the year 1910 VII to the contestant making the longest cross-country flight during the year. The distance covered must be

night outling too year. The distance covered must be at least 40 miles as the crow files, or to a point 50 miles distant, returning to the point of departure. The trophy shall not be awarded unless formal entry for the same has been lodged by the bona fide owner of the machine with the 'contest Committee of the Acro Club of America in accordance with the conditions elsewhere specified. The name and record of the successful contestant shall be appropriately in scribed on the trophy

Vill All tests and trials shall be under the offi-ctal supervision and direction of the Aero Cinh of America, and all questions that may arise in regard America, and all questions that may arise in regard to such contest or trial shall be decided by the Con-test Committee of said club, and its decision in all questions of dispute shall be final, and without right of appeal to a court of law or equity

'X In case the Contest Committee is unable to de ermine which machine has made the best perform nee during the year 1910 it shall arrange that a com cition between such machines be held, and the ma hine making the best performance in such lest shall wawarded the trophy for the year

X No trial or test for the year 1911 will be silowed

until the rules governing the competition for that

Correspondence.

MR RIEDERER'S PROBLEM.

to the Editor

Referring to Mr Riederer's puzzle in the Scientific Annuar dated February 19th, 1910 I take the liberty of submitting what I consider to be the most orderly

1	128	145	1 6 7	189	1 10 11
	2 4 6	2 5 7	-	2 9 10	1 12 18.
	8. 4. 7	8 5 6	8 B 10	8 9 11	1 14 15
	4 8 12	4, 9 18	4. 10 14	4. 11 18	9 19 15
	5 8 18	5 9 14	5, 10 15	5 11 19	9, 18, 14
İ	6 8 15	6, V 12	6 10 18	6 11 14	8. 12 14
	7 8 14	7 0 15	7 10 12	7 11 18	8 13, 15

vay of laying out this puzzle. I signed with No 1 horizontally and used all the figures up to 15. Then I took 2 and used what I could then 3 4, 5 6 and successively which is about all there is to do Waverly lowa H N Woonworn

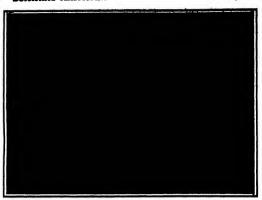
The Current Supplement.

W P Dreapers excellent emailderation of the artificial silk industry is concluded in the current Supplie-MENT, No 1786 Attention has been again directed to the possibilities of radium as a curative agent by MENT, NO 1786 Attention has been again directed to the possibilities of radium as a curatic agent by Sir William Ramany and Sir Lauder Franton. For this reason an article on the subject in the current SUPPLEMENT should be read with interest Lucion. Fournier dowribes the freezing process which was em-ployed in the construction of the Paris Bubway Tho case of Wright versus Paulhan, and some extracts from smdavits and Judge Hands decision in the case of the Farman and Elériot acropiance is corcluded H. Thurn writes on airships, wireless telegraphy, and atmospheric electricity Most interesting is an article T Kume on Japanese particulture, in which he isiders the pearl historically in Japan, mentions the by T considers the poarl historically in Japan, monitons are Oriental bivaives which produce the best pearla, and then describes in dotall the method employed by Miki moto for the artificial culture of pearls. Some experithen describes in odula the method employed by Miki moto for like artificial culture of pearls Some experiments on the expansion of air by heat are described. Automobilists will read with interest an article on a variable stroke gasoline motor Prof T J J See contributes a thoughtful paper on the origin of the sters, in which he endeavors to show that these wonderful craters may be explained by the impact of some sort of projectiles W Nernst contributes an article on general and physical chemistry in the last

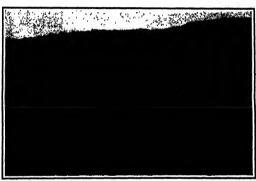
A NEW TELEPHOTO CAMERA ---It may seem far easier than it is to construct a It may seem far easier than it is to construct camera which will give an enlarged image so as to bring out the datalis of objects at great distances. To give a large, image a long focus is not in required, of four foot focus for example that a camera to use this lens must be of vry great length and weight, and connot, therefore, be said to be portable

in the instrument illustrated which was designed on the Vuetter Dufour and Scha aystem, the inventors have solved the problem of preserving the focal length have solved the problem of prescrime the rown lengths of the lons and it he same, thur reducing the volume and which of the apparatus by cutting the focal length into thirds with the said of two mirrors. At 15 who have which lies in the upper part of the double low the 155 was basing through the lens are reflected from the input part of the double low. The 155 was basing through the lens are reflected from the input mirror M placed at the back of the lower statements. box to the introd M' at the front and of the lower section, and themes to the usual ground glass P at the lox to the most of the neual ground glass rather section, and theme to the neual ground glass rather back in this manner a camera of sixteen inches hearth is sufficient for a lone of four-boot focus, with an evident saving in weight and reduction of volume built an instrument is quite portable. The upper part is the contraction of the property of the categories of the contraction of the categories of the drawn up and out of the lower box when the photo-

Up to the present time the different combinations of lenses for telephotography have all had one great or consecs for receptorography nave all had one great faull namely, a want of luminosity and consequent difficulty in focusing it was simost impossible to the satch benes for snap shots. The camera illustrated takes instantaneous views in the usual way Tho



The city of Neuhausen and the Rhine Falls taken with an ordinary camera.



A photograph of military maneuvers taken with an ordinary camera.

lons opening is always in ratio with the focal length of the lons, 10 to 12 for the extra rapid. The luminosity is thus always sufficient for instantaneous work. For the photography of inaccessible places, such as mountains or details of architecture or scenes. in which the interesting spot is at a great distance in which the theresting spot is at a great distance from the observer, the new camera performs very good work, as will be notired in some of the engrav-ings presented here. In a balloon the new system ers it possible to take rapid instantaneous views which would be impossible with an ordinary tele-objective Such views are very difficult to take, not only because of the distance

only because of the distance
of the objects, but because
of the continual movoment of the balloon, which
makes rapid anap-shots
necessary Snap-shots can now be taken up to 1-1,000th second which would be quite

second which would be quite impossible with any tele-lens with which we are ac-quainted. At the full open-ing the present lens gives pictures which are sharp up to the edges of the plate. The present camera has alrealy undergone trials in free bullence on board the

O is the lens, the rays passing tenough this lens are reflect of from the mirror M to the mirror M' and from there to mirror M' and from there as the ground glass !! In this manner a camers of 16 belies 'n length suffices for a lens of its lights from

manner examers of 18 husers of the beautiful control of the contro

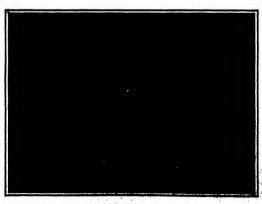
its use in field work is shown in two of the annuxed riews representing army manouvers. In the first

view, taken with an ordinary camera, the troops in the background can hardly be distinguished, while in the second view we clearly see the individual solders and can follow all their movements with sase. One of the view shows a photogramy, taken on board the ballion. "Mars," of the town of Nenhausen and the Rine Palls at an altitude of 1,400 meters (4,400 meters (4,400 meters (4,400 meters (4,400 meters) with an ordinary camera. The second view is taken from the same point with the new apparatus. Its use in architectural work is also seen

Why Are We Right-Handed?

Why Are We Bight-Handed; are we as a man, A. R. N.
From time to time ambidenterity is extelled as generally desirable, and there are to-day educators who consider that development of the left, cocqual with that of the right hand should be begin with that of the right hand should be begin with the entrance of little children in our achools. It is, there fore, porhapp profutable to discuss in what mannar right handedness—by which I would here connot on the contract of the con right-aldrdness in general—has become habitual among 96 per cent of human kind; and whether ambidexter-ity is really desirable

ity is really desirable. The fove animals, at least those which have not been taught tricks, use their fore paws indiscrimitately, the cat strikes at a five plays with a mouse indifferentity with either or both paws; the squirrel manipulates nuts and cliugs to branches quite as indifferentity. Even in monkeys to branches quite as inanimals use the fore paws mostly as hands, there is no suggestion of preferential use or superior experi-



The city of Nonkission and the Rhine Palls, taken with the Ventior-Defests entered

A REW THERESTO SAMERA.

Scientific American

s in the left or the right hand, states Dr. G. M Gould, but animals can be tu-tored to use one or the right paw; the mon-key to shoot man-wise, with the mus-ket butt at the right icer Among ose small-honded-as is due to arresthandedness and am bldexterity have been found to reach a proportion of fifty per cent. But as we tionary scale of nor-mal creatures, and as we exclude disease, we find that ambi-dexterity progressive-ity gives way to sinale - handednoss--con oraily right-handed-ness Sir James Crich ton Browne observed quite truly some

Army maneuvers taken with the Vantier-Dufour cursors.

years ago, that "by the superior skill of his right hand man hath gotten himself the victory" in the sevolutionary struggid. To try to undo his darken pre-emisence is to make for devolution Glimpses of

right-handedness in man, it seems, are manifest in the bronse age and in Paleotithic times It is evident in in Paleotthic times It is evident in the art of the ancients—Assyrian Grecian, Rgyptian Historic investi gation shows that all peoples, how-ever savage, have uniformly used by preference not only one but the same hand—the right. It is said that some races to-day manifest either handed ness, but this is in the last degree doubtful Such statements have, for doubtful Such attacments have, for example, been made concerning the Japanese—that they are by law and practice ambidestrous. But Baron Komura has given positive assurance to the contrary Sir James believes it doubtful whether 'strictly speak lag, complete ambidestry exists in any fully developed and civilized hu

any fully developed and civilised hu man beings, though sometimes very close approximations to it occur." Most human beings, then, are right-handed, though of course, there are those of great institlectuality and force who are ambidestrous having educated themselves to this end, and are exceptional by reason of the pseudostrous having oducated themselves to this end, and culiar and special training they have undergone The origin of right hand

undergone The origin of right hand undergone The origin of right hand ednoss will be found, I believe, to lie much deeper than the individual's voluntary selection whether he will use his right hand or his left, or whether he will be ambidextrous, the reason is to be found in human

in the position of the heart, and in the cerebral structure and organization by which latter all voluntary movements are directed and controlled Consider in the first place how the heart and its

The Parthenon taken with an ordinary camera.

great arteries are left-sided, though in the primor dial organism from which we have evolved there was, it seems, no such symmetry. The savage, from time immemorial, has protected his heart with

his left, his shield arm, but his aggres-sive mantpu lations are made with his right, his spear arm The modern savage though too, bears no shield — which would be use-less against modern weapons - fires his masket uni formly (in a double sense) from the right ahonider, sighting with his right eye, the sword also right



Again, in ob dience to the universal need for barter-so Dr Gould points outthe primitive practice low numbers, one to ten The fingers of the free dextrai hand were first used, and all fingers are now all fingers are now called digits, as are the figures them selves, and the basis of our numbering is the decimal or to fin

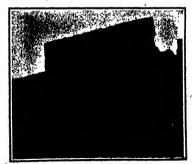
gered system
The second Impor anatomy is that all anatomy is that all our voluntary move-ments are directed and controlled in the cerebral structure and organization The Tho spheres, of which the right presides, by monne of cortain de-

cussating nerve fibers, over the left side of the be

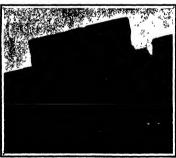
consating merro sinces, ever the left side of the body, while his left brain presides over the right side And functional difficences in the two sides are connected with and conlinear upon differences in the two heat handless of the side of the body, sounds it is blood to the side of the side of the body, sands it is blood to the side of the side of the body, sands it is blood to the side of the body, sands it is blood. iast side of the body, sends in a cood with greater force and directness to the left brain. It does send the blood more directly into the left side of the neck, but the flow of blood at the base of the hrain is so equalized in the "circle of Willia," that the theory the "levie of Willis," that the theory here stated can hardly be accepted as contunitive Besides, it is contradicted by the cases of left-handedness (whith make up shout four per cent of humanity) in which the heart is on the it't side, precisely as with the right handed.

An extremely important engineers consideration is that in right-handed people the "speech center" is situated in Broca's convolution in the cortex of the left frontal lobe, while in lefthanded people the speech center is in the same position, but in the right frontal lobe Now It has been found the left hemisphere deprived the right

no feet hemisphere deprived the right not speech, which is unimpaired in the man under the same circumstances, the man would suffer in the same way, were (Continued on page 268)



Detail of Partheson taken with telephote camera.



The effect obtained by ordinary enlargement of a detail in a photograph.

THERMAL TREATMENT OF STEEL INGOTS

BY J. F. SPRINGER

There are two considerable imperfections which accompany the casting of steel ingots. The more conspicuous one is that of the pipe. This is a conical castly which forms in the upper particle. In Fig. 1 we have by the control castly included a considerable of the control castle of the castle of t

from sit; lugars white exhibit the pipe very theart. In small explanation of this currious formation regards it as a consequence of contraction \(\), and define as a consequence of contraction \(\), and define the local and is told when the togot has cooled off. There is it is at schemeric loss of perhaps the contraction \(\) and while the whole the loss of perhaps the contraction at the moment of solidification controls this matter \(To this, however, the an every is made that gray out from expands at this moment and very life from a pipe Winther steel expansion contracts in the act of first first normal and very life from a contraction of the co

material as may be understood by using the substantial character of those shown to Fig. 2 1 hir cooling effect is consequently a considerable factor. The first solid metal if his cooling ingent will constitute a shell of the cooling ingent will constitute a shell of the shell will undoubtedly standily contract. As this goes on, it works a shell of the shell will undoubtedly standily contract. As the goes on, it would be exceeded. There would have a risk a tendency to a "met," with the shell upon final cooling larger in cross section than would otherwise have been the case Of notres, the solidifying material contacting further, one may conserve that, as the shell these, successfue layers will come to normal temperature with expanded cross sections, for reasons similar to those iontrolling the outer shell. If as much is granted, it is easy to see that therm is a tendency to leave the region of the axis empty. There is, however, another incidency at work seeking to untilify this. This is the gravitation of the did metal. This tends to fift up the sign as the bottom. And so the over portion of the loger becomes solid throughout the color of the loger becomes solid throughout the politic heave importion, with the nail that a pine really forms, and that it is more extensive to cross sections, not one seconds.

To eliminate the pipe many procedures have been employed. These divide the meet less into the mechanical methods and thermal ones. Perhage the most successful principal which has yet found the way into commercial practice is the Harmet procedure described in an artisk by the author in the 80 weeks August August August 1, 1909 Methods, such as this, operate

with a view of eliminating the pipe through the foreing in of its walls upon themselves while the interior of the ingot is in a liquid or plastic condition the elaboratones of the apparatus necessary, and the length of time required, are serious considerations

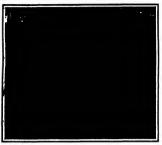


Fig. 1 —The six transverse slabs and the right-hand vertical slab were poured by the hot-top process.

which operate against some, at least, of the mechanial processes. But offers have been made to solve the problem by thermal mean. If the steel at lively could be kept highly liquid until the lower part of the inget becomes solid, then with such a reservoir perhaps the pipe could be progressively filled uple at the formed. Upon some useful fundamental jets the thermal processes depend Krupp is said to have pour motion size upon the tops of the lingest Amazemity



Fig. 8. "aux cur's overflow method of pouring ingots,

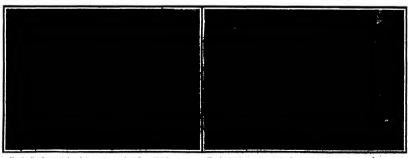
but fittle is known of the measure of success. This might, perhaps provide a good method. The sing might provide a good method. The sing the single s

way Experiments have been tried where the metal was steel, size, and was. All show improvement No doubt this effect is due to the restandation of the cooling thus effected at the top by the provision there of a larger mass of metal. That is to say, the pipe is shortened it cooling is accomplished from the cooling in the cooling is accomplished from the cooling

short-use it cooling is accomplished from the foot. There is, however, a storag objection to There is, however, a storag objection to the length of the cooling in the cooling of the cool

pipe out-red to yearing with ine one end up to a control of the pipe of the control of the contr

Now all these experience prepare us to expect a decleded surcess from the Riemer hol pop process as used in Gormany. This investor spilles a gas furnace to the tagot top. Apparently, however, others had had a similar idea. It would seem that their processor recleded but sorosaderable attention. Now Riemer not only applice his furnace but he applies it at once Purther, he provides an immense supply of heal. Its tuss prevents any tooden'y to the formation of a creat over the long However whether we understand why it should seem nevessary to furnish heat tool only in great amount that with great promptimes the fact



Pig. 2.—Gas furnace is here being used to pre-heat the mold before pouring.

Fig. 4.—Gas furnace in operation beating the top of a 18-box inget while molal the large.

In the proper pouring the top of a 18-box inget while molal for the property pouring the top of a 18-box inget while molal for the property pouring the property pouring.

EGGS-OF CURIOUS FORMS

BY PERCY COLLINS

When we consider that with the exception of the class manmalls, practically every creature deedling upon the earth at the present monesant began life within the walls of an envelope popularly termed as duty for a very varied assemblings of objects. Not many people are aware that even the mammalis (or manimals that such their prompt include several eaglayers, yet such is undoubtedly the case. These issues of the continuation of the continuatio

whose habits comparatively little seems to be known, save that they subsist mainly on insects, and that they really do lay eggs. Much more detailed accounts are extant respecting

Much more detailed accounts are extent respecting the habits of the duck bill Orathorhyn-ksp personnel and the second of the sec

hatched, the tiny duck-bills are both blind and naked, but in process of time they acquire the adult characteristic, and issue from the nest hole to feed and frolls in the river with their parents

frolic in the river with their percents
Leaving now the mammalis we find that all known
birds lay eggs, the ingreat being that of the certiciMany of these eggs come from Africs, and after one
serratched, painted, "poker worked" or otherwise
adorned, are used for decreatively purposes. Thus
are all familiar with them, and can resilise that the
contents of one would form a bountiful meal that
the catricks sext would have appeared quite small be(Continued on page 28)







Duck-bill and egg.

Male midwife from

Onckeo and its ogg compared with kiwi and its ogg









1 Egg cluster of common whelk. 2 Egg-chain of turret shell.

Egg-case of

Egg-case of hammerhead shark

Typical cluster of anakes'









Eggs of bousefly (magnified).

West Indian Bull one shell and egg

Eggs of a moth (magnified).

Egg clusters of Montis or " rear-horse"



Eggs of parasite of hornbilli (magnified).



Egg of gaptier tertains—a perfect



Egg of parasite of domestic fowl (magnified).



Rgg of parasite of a bird lone (magnified).

ees of CURSONS PURSON.

CURIOSITIES OF SCIENCE AND INVENTION

MOTOR-CYCLE AUXILIARY FOR BICYCL

A power attachment for bicycles has recently been invented which calls for no structural elterations to be made in the ordinary bicycle and which can be attached or detached in a few minutes. The dovices etterned or decented in a few minimes. In a correct comprises a small nutrillary when 20 inches in dismeter fitted with a light motor which is connected to the rear wheel of the blcycle. An ingenious pivoting



A POWER ATTACKMENT-FOR RICTCLES.

arrang arrangement allows the whom a pocumar lateral and workleal movement, so that the steering of the ma-thine is in no way affected and permits the wheel to glide over obstacles or rough ground without trans-

thins is in no way affected and permits the wheel to gife over obstacles or rough sround without transmitting any shock or vibration to the rider. The motor is a small air-cooled, herricantal, two-arrole enatine with a specially designed but to which a specially designed but to which the state of the st

to carry the motor 100 miles

A NOVAL MIDEA-PCRATTAL PRIMARY SATTERY.

A new and ingentous high potential primary battery, the purpose of which is to supply electric short and a supply electric short and a supply electric short in Magnilar Physical Society. The positive senses of each cell cranists of a small carbon red, while a strip or mays size countries the nature short in the state.

each cell consists of a small carbon rod, while a strip of pure sinc comprises the negative clement, the also-trolyte being a solution of calcium chloride. The connected ends of the elements, which are mounted in parallel rows of 26, are buried in parassis.



A MYGROSCOPIC MIGH-POTENTIAL BATTERY.



CARRON ELEMENTS.

Contact between the free carbon and the sinc elements is just broken by a small pellet of parsfin, and the liquid is retained between them by capillarity

itquid is retained between them by capillarity. The electrolyte comprises a enturated solution of calcium chloride which has been exposed to the air, lieing hyprocopic it will shoor water until a certain equilibrium etrength is obtained, this factor depending on the humidity of the air and the temperaturs. The electrometive force of such cell differs from one voit by only two or three per cent if exposed to very different conditions of temperature and humid-ity, but it has been kept stoady to within 01 per cent

for two or three consecutive days.

In conjunction with an obstroctatic voltmeter, the battery is very convenient for the following purposes In all experiments involving the use of a quedrant voltmeter, as the needle can be charged to any desired voltage up to 1,000 volts, since the battery is so de-signed that one or any number of elements can be taken, for the comparison and calibration of electrotaken, for the comparison and cathration of electro-stetic voltmeters, for the comparison of capacities, and for the measurement of high resistances by the method of discharging a condensor through them and noting the time taken

DETROTOR FOR FIRE-ALARM BOXES.

DEFINITION FOR PIER-SLAIM SOLES.

The problem of so designing a fire alarm box that it can be opened and operated by any one in an amergency and ret will tend to pervent the sounding of falso alarms, is one that has engaged the stending of falso alarms, is one that has engaged the stending of linear tending the state of inventors for many years at very impulsion additional content of the state of the stat operator of the alarm, whose services might be badly needed at the fire Instead, however, the handons

chould be of vaine to small as well as large dealers. The machine consists of a magazine and a means of taking one cap at a time from the magazine and preseng it firmly into piace on the top of the milk bottle. It not only adds to cleanliness in dairies, but saves e inasmuch as it is many times more rapid in the operation of capping bottles than the hu



PORTABLE BOTTLE-CAPPING MACRINE

hands. One type is portable and is operated by a quick squeeze of the headic. The other type constant of a battery of cappers which will operate to cap a number of bottles at once. The magazine takes the caps in packages from the machine which made them ates the necessity of handling the cap itself

UMBRELLA SHELTER FOR AUTOMOBILES

It is impossible to enter a vehicle on a very rainy day without setting wet, because the umbrella must



DETROTOR FOR FIRMALARM BOXES.

serves morely for identification. It is made of such form that it cannot be concealed under the cost elsew and it betrays the sounder of the alarm to the gen oral public, and is an honor to a man unless the sarm is a false one. Not until the fire chief has arrived with a special key to fit the handcuff may the device be removed. This system is also applicable to borne which are locked. It frequently appears in such cases that the keys are locked and it is impossible to determine who sounded the slarm even when it is known whose key is making.

GAPTIES SILLS SOTTLESS BY RAGETS.

Greater present ions of the cheen in landing milk than any present ions of the cheen in landing milk than any present ions of the cheen in land to such as such as such as excellent medium for breeding germs. Hand work is atways objectionable because of possible contamination from unchean flagers. Harveloters milk bottles have commonly been capped by hand. Now a simple matchine has been invented for doing tithe work with matchine has been invented for doing tithe work with the contract of the contract o



A MACRIER FOR CAPPING POUR MILE SOTTLES AT

be lowered before one can step haide. Surely it is just as necessary to provide vehicles with some sort of a shelter, such as the averlage of a store or the most of a shelter, such as the averlage of a store or the major gues of a public building However, anything projecting from the side of a whelch would be objectioned. The difficulty is surmouted quite ciercry in the au temobile, while a surmouted quite ciercry in the au temobile, while a comparing a collapse of the surmouted purpose of t we make when the moor is opened to admit the pas-senger or to allow a passenger to alight, the awaing will open and protect him from the rain while he is raising or lowering his umbrells. When the door is closed, the awaing shuts up like a fam.



THREETA CERTIFIC FOR APPROPRIES.

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BRINGST PAPERED STREETS

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for the three tames are then not be as a become of any other maches. Yet be joyn to seen that of the property of the proper

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A TRIP IN THE LABORET BALLOOM

A TRIP IN THE LARRIEF BALLOGE,
(Consistend from page 26c.)
thing she was a midsummer night's
dram. It was only by as effect of resson, or when, through a powerful glass,
we distinguished animals in motion, that
we restised the home of seven hundred
thousand souls to be other than a microscopically beautiful toy

creacopically beautiful toy
"When nearly above the office of the
Inquirer, we celebrated this occasion by
fying our balleat and shooting upward,
which turned us more to the east, and we
were above the Delaware, at an altitude
of about a mile Here we verified the
fact that we could see with the naked
eye the bottom of the river, and with a large apygiass clearly distinguished the great stones in its bed "Indeed, one of our fellow voyagers in-

"Indeed, one of our fellow voryagers in-sisted upon it that he observed the mo-tions of the fish. Certain it was that the ripple of the plying steamers was most marked, and then we turned to the ship-ping Havio't taken a particular squint at the Island of Smith, and the still more celebrated Thicum, we reached the Jersey side at five minutes peast the descript Centrol in all its pitory. The ourrent took us more directly toward the iowed closely the Camden and Atlantic Railroad, which could only be distinguished from the turnpikes by the aid of guanted from the intriplices by the aid of a giass. In the moving panorams, the fertile fields of East Jersey formed a most beautiful portion with the Rancossa and Co per's Creek winding anakelike through wes oblong inminutes, distinguished only by the different colors of ripe wheat, growing corn, and other to-kens of peace and planty Toward the ocean, a bank of cumulus clouds rose up, ocean, a bank of cumulus clouds rose up, and in the west the city was growing dim. We passed over Haddonfield and near Long-a-coming and Waterford, then began to go much higher and faster, havpassed right through a flercy cloud leath us stretched almost interminable pine forests, with the white sand sparkling here and there in timy patches We were at this time at the highest siti tude attained during the trip, about three miles, and moving to the east at the rate of at least sixty miles au hour Here the earth appeared convex instead of concave, a appeared convex instead of concave, as pheanmenon often observed and ac-rounted for, but some the less curious, and high as the barrometri. location of their bodies. We includingly got up the lad vier into the hoop and insisted on sing-ing some, which, owing to the rarefaction of the sint and the orbo from the bodies. had quite a sentorian effect. At this point, as we were far above the smoky bees surrounding the earth, and also the region of clouds, the aky looked more beautifully bits and wirld than can be beautifully bits and wirld than can be beautifully bits and wirld than can be sufficient to be proposed below, save to the few clouds that to use the work of th

minutes The atmosphere, even at greatest elevation, was not so cold as expected, owing to the rays of the sun aspected, owing to the rays of the sun being purearily refrared from the hary clouds below The chief physical mani-leratation of our situation was in the ears, for when descending from a more rare-fied to a dense ratnophere there was a whitsing, much like that in the diving, and from the amme cause.

"Although it had been the accounting the annual to the companies of the companies of the intention to mach the companies.

intention to reach the ocean, which now was visible, the salis on it being seen by was vision, the sails on it being seen by the talescope, yet a delay of two hours, occasioned by the vastness of the prepar-ations before starting, limited the time so that it was an alternative to land on a swhat uninhabited coast without day somewhat uninabited coast without cap-light to direct us to a proper spot, or take the back track. The latter course was most prodent in reference to the se-curing of the balloon, and as affording

(Canchided on page \$67.)

AMERICAN HOMES AND GARDENS

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MUNN & COMPANY, Inc., 361 Broadway, NEW YORK

(Concluded from page 266) copportunities for its conveyance to

Philadelphia So we came down very fast, aided more than was entirely desired by the failing dews, and the con-traction of the gas after the auns rays had so much diminished. However by a wholesale throwing off of ballast, we kept wholesale throwing on or uninar, we acquire to the northwest, until observing that a crowd was gathering from all points of the conjuss in the neighborhood of Medford evidentity calculating on onr descent and shouting loud invita tions, we gratified them and promised their assistance. A large number of willtheir assistance. A large number of which me men caught hold of our long trailing rope by Mr Lowe's direction Our gas was allowed to escape freely, and we handed on a large sand bur one of the best places that could have been selected, at a quarter past eight after about sixty miles of the piesantest voyage it is possible for man, the unwinged bird, to

VERTICAL PROTOGRAPHY

(Concluded from page 256)
ground is placed under the glass supporting the article to be photographed.
The distance between the support and the background varies from three inches io eighteen inches. The greater the distance the less reflection. The color of the background is generally determined by the color of the object to be photographed When working under the aub-ject, the light can be reflected under, rendering the background more tone, or on the subject proper, giving not only more illumination but illumination of greater uniformity Some subjects re-quire a neutral ground. In this case the photographer will change his back-ground many times during exposure He ay start out for lustance, with a pure may start out for instance, with a pure white ground on top and remove grounds which are piled one on top of another until he passes through many shades, ending the exposure with probably a vivil red This changing of backgrounds during an exposure with often bring out an object that would have other

Cameras are manufactured especially for work of this nature and have scales of measurements so arranged that the ground glass support is part of the camera proper but movable either way camera proper but moveste either way with a tituub screw, so that an allow-ance can be made for objects of various this knesses. By attaching the support to the camera the camera can be swung or revolved during the exposure giving a uniform illumination to the subject. a uniform illumination to the subject. The camera may be supported by a tripod in a vertical position, as shown in
the illustration. When in the field the
camera may be suspended from a tree Hmb

A stand, such as shown in the titt tration, may be easily made and will answer all purposes admirably Any camera can be thus used with good re-

A tilting tripod head which is aimple in construction and inexpensive in cost, may be used in this style of photography to a good advantage. In many cases most pleasing results have been secured by this simple device. A sheet of glass for a background a tilting top for triped, and the outfit is comuleto

INTERNAL COMBUSTION PUMP

(Concluded from page 257)
of the column of water cannot be suddenly arrested hence the pressure in O
tonds to fall below that of the atmosphere and the exhaust valve # opens as
well as the water valves V Water rushes in through the water valves, mostly follow the moving column in pipe rollow line moving column in pipe D., but partly to rise in chamber C, in an effort to reach the same level within that chamber as in the auction tank When the kinetic energy of the moving column gas has ampended itself by forcing water into the high level tank, it comes to rest, and, there being nothing to prevent a re-

turn flow, the column starts to mov back toward the pump, and gains veloc ity in this movement until the water ity in this mavement until the water reaches the level of the exhaust valve, which it shuts by impact. The result is that a certain quantity of burnt products of combustion becomes imprisoned in the cushion space F und the energy of the moving column is expended in co the moving column is expended in com-pressing this gas cushion to u preater pressure than that due to the static head of the water in the circuit tank B T Consequently a second outward move ment of the column of water takes place. ment of the column of water taxes much and when the water resultes the level of vario E the pressure in the space F is oner more method, and further movement of the water opens valvo A by suction against a light spring, and by saction against a light spring, and draws in a fresh guscous charge if there were no friction the water would fall to the same level as that from which the last opward motion staried, but the amount of caminstible charge drawn in is slightly less than this movement would represent Once again the column of water returns under the clevated tank of with returns under the elevated tank pressure and compresses the charge in the combustion chamber which is then ignited of the moment of maximum com-pression, and the same cycle of opera inne is repeated

Ignition is timed by a small an paratus somewhat resembling an ordin ary engine indicator, which closes the electric ignition circuit at the point of maximum compression, an ordinary small battery, trembler coll, and sparking plug as are used in automphile practice

as are used in automnille practice in starting the jump for the first lime, compressed air is allowed to flow into the combination chamber intil the volume of air introduced is rather larger than the usual charge. The exhaust valve is then auddenly opened by means of a hand lever, and the escape of the compressed air permits a movement of the water col umu, which gives the cushion and suction strokes, and so draws in a fresh com-bustible charge, which, when the current is switched on and consequently fired, starts the pump working regularly When the pump is stopped in the usual way ir regular work, it always stops with a fresh regular work, if always stops win a rresul-charge of explosive mixture present in the combustion chamber, so that it is only necessary to switch on the current and the pump is started up. This enables the pump to be set in motion from the switch-board and without any preliminaries

is now in regular daily work at a large pumpling installation in the Midlands, giv-ling complete satisfaction. The absence of all completed gearing such as exists in all completed gearing such as exists in standing feature, and guards the engine standing feature, and guards the engine saginate breakdown, in only port that could fall beling possibly a defective mashroom valve or gyring. Wear and tear is also reduced to an insignifi-crat quantity, and the treshbes hecidantial is now in regular dally work at a large

cant quantity, and the troubles incidental to inbrication are overcome.

In its simplest form the apparatus converts gas power into hydranile power, and may, therefore, be called a gas pump, but if the power is to be taken of a rotating shaft, the high pressure water is passed through a water turbine, and so lack to the suparatus to be continually circulated. The transfer over the territory of the suparatus of the continually circulated. The invention can also be applied with pression of air

The pump has been elaborately de-scribed by the inventor in a paper pub-lished in the SCIENTIFIC AMERICAN Sur-

RAPID TRANSIT BY RELY CONVEYOR.

with transverse shafts which carry the driving wheels of the platform. The gradation in the rate of speed of the sections of the platform is secured by varying the diameter of these driv-ing wheels, which are a inches in diameter for the Junio 15 inches in diameter for the 5-mile is inches in diameter for the 5-mile platform. The driving whoels are covered with



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er, as are the hore guess wheen, and consequently the sin-tion of the platform will be both simpoid and stient. The specemetre sections are coupled together by means of links it inches in length, and the coupling pins are placed at the center, from which the are placed at the center, from warm rae curves of the abutting ends of the plat-form sections are struck, consequently, the opening between the joints may be reduced to a minimum, and a smooth surface presented for walking, with no open spaces to bewilder or trip the pas-

songer

The passenger-carrying capacity of
the moving platform is just double the
maximum capacity of the present Subway trains. According to the figures of way trains. According to the Squree of the Public Service Commission, the total rusb-hour capacity of the five-car local trains per hour is \$2,500 and of the eight-car express trains \$5,000, whereas the moving platform, according to their estimate, would carry 72,500 passengers per hour. They state furthermore that for all distances less than four miles the noving platform is a quicker and more convenient mode of conveyance than the resent local train service and even nicker than the local and express servquiezer than the local and express sort-loc combined, since a passenger may reach Times Square Station, from any local station south of Fourteenth Street (that is, supposing a moving platform were installed on a north and south avenuo) quicker by the moving platform than by the local and express trains of

than by the local and express trains of the present fishway. In conclusion, however, we would sound a note of warning with regard to the possible interference of any moving platform solway that may be built with any future extensions of the present Sulway In selecting the routs, care should be taken to choose a focation muonic per taken to choose a location where the moving platform subway will not block any of the future through lines which must ultimately be built on practically every avenue in New York

Why are We Right-Handed!
(Concluded from page 261)
the lesion on the right side. The hand
and arm centers in the hrain are inti and arm centers in the hrain are inti-mately linked in the cortex with the matery inked in the correx with the speech centers. And certainly Crichton Browns is correct in the inference that the preferential use of the right hand and arms in voluntary movements is du to the leading part taken by the left brain "We could not get rid of our right-handedness, try how we might, it is woven in the brain." And this, I beis woren in the brain." And this, I be-lieve, is the conclusion to which we must scientifically arrive "In the curious dis-same aphasia, in which one forgets words, the lesion lies in Broca's convolution, one cannot say cup, for example, though one sees a cup, but when the right hand touches the cup, the patient at once ut-

Here one reflects ovolution, did the heart tend to be on the left side, and the left brain tend to greater development, because the right hand same to be the most need? Or did the right hand come to be most used, the right hand come to be most used, because of these heart and left brain phe-nomena? I am, for my part, of the for-mer opinion; the heart on the left side, and the greater left-brain development, are effect rather than cause, coming gradually to pass as man, in the strug-gia for the survival of the fittest, found right-handedness more and more advan-

right-handedness more and move tragerons.

Of course, there are professions and trades in which to cretain amount of amiddenterity is essential. For example, the plants in playing the fugues of Bach, must produce with the left hand shows the same tones as does the right, and has to work a tittle harder too, for the bean rotes of the plane are more titleitly wired than the troble. A certain amount of ambidecterity is essential in the surpson. Tet this gift has its disadvantages, within its when colleague shiftled in this way destined to me that the contract of the colleague shiftled in this way destined to me that the colleague shiftled in this way destined to me that the colleague shiftled in this way destined to me that the colleague shiftled in this way destined to me that the colleague shiftled in this way destined to me that the colleague shiftled in this way destined to me that the colleague shiftled in this way destined to me that the colleague shiftled in this way destined to me the colleague shiftled to the colleague shiftled in this way destined to me that the colleague shiftled in this way destined to me that the colleague shiftled in this way destined to me that the colleague shiftled to me that the colleague shiftled in this way destined to me that the colleague shiftled to the colleague shiftled the colleague shiftled to the colleague

time in wondering which hand he d employ. But it is rarely really

Finally, it may be objected, in favor of general education in ambidexterity Suppose one loses his arm, and that such uppose one loses his arm, and that such in unfortunate be a clerk, who must arn his living by writing Such con-ingencies are almost as rare as the amous one by which Mrs. Brown justi fied to her husband her junk-shop pnr-chase of a hrass sign stamped "John Jones, Undertaker" "Our daughter with soon be of marriagable age, she may marry an undertaker whose name man marry an undertaker whose name may be Jones, possibly John Jones, think how handy the sign will then be" In those rare cases of right handed mutila tion there will in time follow, through education and practice, an adequate de-velopment of the right brain, just as if the unfortunate had been left-handed

TREATMENT OF STEEL INCOME.

(Concluded from page 262) remains that hy doing so Riemer has been able to demonstrate his success in pipe elimination on a considerable and commercial scale. A large number of steel shafts, the steel for which was made sited shafts, the steel for which was made by this process and with which the dis-card was kept at 10 per cent or ices, have successfully passed the British Board of Trade requirements. Indeed, a reference successfully passed the British Board of Trade requirements. Indeed, a reference to Fig 1 shows an inxet, treated by this method, in six transverse slabs on the right and left. The slab shown on the upper left hand came from near the top of the ingot The iongitudinal slah to the right of the center of the figure is from another ingot treated by the same hot-top procedure. The inconsiderable depth of the pipe seems pretty evident It extends perhaps 10 per cent of the total length But the actual percentage of steel involved is avidently much less 10 per cent of the total have in Figs. 2 and 4 two views of

the gas furnace There is an eye at the top which facilitates movement of the apparatus. Through two pipes—seen to advantage in Fig 4—the gas and air enter The air is under pressure In the furnace may be employed as a mean of heating the top of the moid prepare tory to teeming the steel into it. then be let down until its lower edge is well inside the mouth of the moid, when the pouring of the steel may be performed without removal steel may be performed without romova-of the turnate. There is thus ample op-portunity to begin action without delay However, it is regarded as important to have not only prompt application, but an intense heat at once. This requirement in tense neat at ourse this requirement is met by preheating both gas and air In fact, heat may be applied in such in tensity as to raise the temporature of the of the logot above the point of fa-It has been found nunecessary to rolong the treatment until solidification completed. This is a favorable item, is completed. This is a favorable item, as thus the apparatus is released for other service, to which its portable characteristic of the service, to which its portable characteristic of the service is not possible to the first the third product is in the service in the service in the service is not service in the service is not service in the service in the service in the service is not service in the service in the service in the service is not service in the service in the service is not service in the service in the service in the service is not service in the service in the service in the service is not service in the service in the service in the service is not service in the service in the service in the service is not service in the service in the service in the service is not service in the service in the service in the service in the service is not service in the servic not outy to conserve the heat of the mol-ton steels, but also to prevent heat loss by conduction from the gas fames. The furnace is being used in Fig. 2 for the purpose of preheating However, the in-got is, in this case, said to be present Now in all procedure for the elimina-tion of the nine we must at seath and

Now in all procedure for the elimina-tion of the pipe, we must act reach final conclusions as to their success without inquiring as to the segregation. The seg-regation is a locality where the steel has an access of carlon, supharp, hosphorus, etc., beyond the average contained in the inget as a whole. Ordinarily, it should be removed. As it is unsulty localities that of the coupling the larget a little below of by cropping the larget. Still below that poths. Element, it is well to inves-



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tigate this question with some thorough ness, as the mothod of treatment itself may, conceivably, introduce variations from the rule Sivel of uniform compo-sition is wanted An ingut cast by the sition is wanted An ingot east by the holotop process was investigated as to its composition. The average carrion con tent should have been 0.2 is per cast. By taking samples along the axis all but one were found to contain carbon in per-centages running from 0.23 per rect to 0.35 per cent. The everyation was close mader the tail of the pipe. Its carbon mader the tail of the pipe. Its carbon percentage was 04i per cent. Similar results were found for sulphur and phosphorus. Thus they existed in the segre-gate in percentages about three and one-half or four times what they did below it.

EGGS OF CURIOUS FORMS.

side the extinct Madagasear hird, the Epyernis, which measured more than thirty inches in its smallest circumfer-

The amailest birds' ages are those The smallest birds' aggs are those of the minute species of humming birds, which are smaller than the eggs of cer-tain kinds of tropical beeties. But the common cuckoo lays the relatively smallest egg That is to say while the jack-daw and the cuckoo are about equal in size, the formers egg is five or six times larger than the latters The fact that the cuckoo is wont to deposit its eggs in the cents of birds which are usually much smaller than itself doubtless accounts for this The relatively largest egg is laid by the kiwl, a strange wing-less New Zealand hird The egg is no less than five inches long, aithough the ex-treme length of the bird itself is only twenty-seven inches.

Reptiles eggs are not very attractive

objects. In the case of crocodiles and many kinds of tortoises they are paiecolored or white, and resemble those of birds in shape. But the egg of the gepher tortoise is remarkable for its complote roundness. It might wall be mis-taken for a golf ball! Many snakes eggs are soft skinned, brown as to color, and look for all the world like a number of ew potatoes.

new potatoes.

The reggs of fishes are usually small, soft, and inconspicuous. The most remarkable polot about them is the extraordinary number laid by the individual. A single cod for example lays as many as nine million eggs. But a strik ing exception to this piscine rule of numarous inconspicuous eggs is seen among tha sharks and their allies These "tigers of the sea" ky eggs which are large in size, few as to numbers, and doposited singly instead of in masses. These eggs. or which several examples are known in the accompanying photos, are known to flaherfolk by auth names as 'play purses' "fairy purses,' or "mermaid's pursos." They consist of a dark-colored, leathery suvelope, and are usually adorned with frills, horns, or long twistadorand with Irilia, norms, or long twist-od tendris. These appendagos serve the purpose of kouping the CRR came aup ported among the branches of neaweeds, thus preserving the embryo from the damagen it would assats were the "purse" curried hither and thither by

Amphihians-frogs newts, and the like —lay fish-like eggs without exception The Surinam toad, however, has a re-The Surinam tond, however, has a transmission of dealing with the eggs whose they are laid. The male takes the issue one by one, and imbest them in the degree of the suring the suring the suring the suring the suring the suring tonds hatch. There may not some suring the suring tonds hatch. There may be as many as one hundred and irectly cells in the back of a single individual core in the suring the suri nore common number

The egg laying habits of the "midwife" frog of Europe are almost equally curi ous. The eggs are deposited by the fe-maie in the form of long chains which may be upward of a yard and a haif in length These chains are taken by the male and wound around his legs and (Ooncluded on page 270)

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Insulty No. 9000. -Wanted the soit

im the seasoner, after rough weather, may often be seen an object which hears uo small resemblance to a cluster of uproje grappes. This is a mass of cuttle fish eggs—that strange, eight-armed molluler which disports itself in the waves to the undoing of such marine creatures to the undoing of such marine creatures as are unlucky enough to come within grasp of its suckers. Each "sea grape" is produced with a featble stalk, by means of which it is joined to its felmeans of which it is joined to its fel-lows, the whole mass being fixed to some stationary object, euch as a rock er stone But like the eggs of so many ma-rine creatures, the eggs of the cuttle are rane creatures, the eggs of the cuttle are at the mercy of the elements, and in times of tempest they are often torn from their moorings, and cast bruised or broken upon the shore. Near relatives of the outtle are smalls

and shellfsh of many kinds, and among this great group of animals' eggs so many strange forms are found that a description of them would fill a bulky volume Many of the large land mails produce hard-shelled eggs, differing little in appearance from those of birds. An example is the West Indian Bultsus. and shellfish of many kinds, and amone rample is the west indian satisfies, shown in the annexed photograph, to gether with its white, clongated egg But the egg cinster of the common whelk (Bucrinum) is like a rather dingy he comb, partially squeezed between hands. When the eggs are alive hands. When the eggs are alive and healthy, the form of the young whelks can pishinly be seen through the semi-transparent substance which envelops tham. Another quaint form of molius-can eggs is that produced by the intract chelifish (Turrei-rilo) The eggs are joined logother like a number of small beads on a fexible cord

Johns to operater the extension of money of model on a few portion model as are varied in appearance, the eggs of insects are the indictly more so. Moreover, many of them are marvelously beautiful in form and embellishment This beauty is almost always hidden from the eye unaded by the microscope, for the eggs of most insects are more specks, often less bulky that a grain of sand Who, for instance, would expect to find beauty the end of the eggs of many butterflies and moths—mere stoms laid upon a leat—ene stoms in the egg of the most of the south. above that of the ostrich One ponders npon this strange problem without gain-ing enlightenment. Why this delicate ing enlightenment. Why this delicate inserverk? Why this flower-like elegance? Above all, why adorn at all objects of such extreme minuteness? The smaller the object, the greater the care Nature seems to lavish upon it. An example of the fact is found in the case of eggs laid by the minute insects which spend their whole lives among the feath ers of birds. These minute beings pass under the unsavory title of "lice" Yet under the unavory title of "iles" Yet their eggs, when megnified, exhibit an amusing diversity of form and a beauty quite fairy like Tbey are among the most popular of microscepic objects. In conclusion it may be said that cer-tain insects deposit their eggs in clus-ters which bear no little resemblance to

nuts or fruit Such is the case with the "rear-horses" (Mentider) and their allies. Possibly this resemblance may be of im-

portance in protecting these eggs from the attacks of insectivorous birds and

Comets Expected in 1810, The present year promises to be pas ticularly rich in comets. Four comets those of Winnecke, Daniel, Halley, and Inness, have been or are already visible.
Inness's comet, which was very@right, appeared suddenly, it will be recalled, in the midst of a recent auroral display

Home-Made Experimental Apparatus

AN SLEOTRIC CHIME AND NOW IT MAY THE CONSTRUCTION OF AN ELECTRIC TREEMOSTAT is explained in Scientific Ameri-TRIESPAPE OUTSIT IS told by A Pro-A M.E.P. ALTERNATING CURRENT DY THE COMPTRUCTION OF A SIMPLE PRO-

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THE LOCATION AND RESOTT THE INSTALLATION AND ADJUSTMENT OF A 188-MILE WINGLESS TRICKSAPE OUT FIT, Ulmetrated with diagrams. Scientific American

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Good articles on SHALL WATER MOTORS are restained in Respettive American Supplement 1004, 2005, and 1005. HOW AN REPOTRIC OVER CAN BE MADE

THE SUILDING OF A STORAGE BATTERY

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four, seven periodic comets are ex-te return in 1810. Probably not ly not all o these comets will be visible, because at will be unfavorably situated with rest to the sun at the time of perihelion pas-sage. The expected comets are the fol-lowing '1 Giacobini's comet, 1896 V lowing '1 Giacobin's comet, 1895 V II was first thought that this comet would reach its perihelion about the middle of February, but later calculations have proved that it really passed its periheproved that it really passed its perihe-tion last December It has not yet been seen and, as its position is very unfavor-able, it may escape observation alto-gether. 2 Swifts comet, 1895 II Thie comet was not seen at its return in 1902, and unless its orbit has been considerably changed, the conditions for its ob-servation will be still less favorable this severation will obtain less tavoranic this year it should have passed its perihelion about the end of Jaunary, and should theu have been almost exactly behind the sun 3 The second periodic comet of Tumpel should reach its perihetion about February 21st unless its orbit has been greatly changed since 1904, has been greatly changed since 1904, when the comer was last seen. The conditions for observing this conset in its perited on passage this year are, how see, very unfavorable as, like Swifts comet, it is simused behind the sun. 4. D'Arrori's comet was seen for the first limin is 1871, it was expected to return in 1804, but was not observed, sell in 1804 but was not observed. in 1904, but was not onderved, weing to unhavorable conditions. This year, if its orbit is not changed, it will reach tits peribbilion in Octobr its position then will be very favorable for observation, so that this comet will probably be visible next summer 6 Spitalors comet, visible next summor 6 Spitaiers comer.

1890 VII escaped detection at its visits
in 1897 and 1903, because of poor condi-tions for observation Dr Hopfer, of
Tricate, has shown that the orbit of this comet has been greatly altered by per-turbations caused by the influence of Jupiter between 1890 and 1903. In con-Jupiler between 1890 and 1997 In sequence of these perturbation, the periodic time of the count has been lux reased from 6.42 years to 6.82 years. The counts of the count of

Moving Picture Moyaltics, The moving-picture industry is on a distinctly theatrical basis it has its "trust," its theaters where actors play before a camera, its scene shifters, its supernumeraries, its property men, and a whole theatrical staff more or less simi lar to that of the regular theater The
"trust" in question was formed about a
year ago by a number of manufacturers
of films under the title of the Motion Pictures Patents Company Patents, chiefly those of Thomas A. Edison, were chiefly those of Thomas A. Edison, were pooled, and active steps were taken to purge the moving picture theater of some of the more objectionable pictures which have brought down a hail of criticism upon the industry, to license the moving-picture theater to use the apparatus and exhibit pictures, and to control the inexhibit pictures, and to control the in-dustry in general. There were many in-dependent manufacturers who refused to pay royalties or to acknowledge the patent rights of the Motion Pictures Patents Company A suit was recently brought by the company against Car Learnine, a well-known manufacturer, and the Independent Moving Picture Company of America, of which he is president, as well as the Pantograph C president, as well as the Pantograph Com-pany, to restrain the alleged further in-fringement of Edison patents controlled by the Motion Pictures Patents Company. Insamuch as the patents in question had already been adjudicated and their va-lidity upheld, an injunction was granted The hearing brought out some very steresting statistics, which will undoubt edly open the eyes of the gener (Concluded on page 271.)



The Design and Construction of Induction Coils

By A. FREDERICK COLLINS

trations. Price 33 69, people in ill practice in minute details full practice and the colling with the coll, waying from a small one giving a half-inch spark to a large one giving a half-inch spark to a large one giving a parts. The dimensions of each and every to the smallest screw are given and the ligans are written in language easily con

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(Concluded from page 270)

or five million persons attend the thir-teen thousand moving picture shows of the United States. The pictures which the United States. The pictures which fileker on the acreen before the speciators are projected by means of apparatus, the basic patents of which were taken out by Thomas A Edison These four or five million persons, therefore, unwittingly pay royalty to Mr Edison whenever they hand in their nickets or their dimes at the box office. It is stated that about 1 440 000 feet of film are may by the members of the Motion Pictures Patents Company On this production a royalty of half a cent per foot is paid to Mr Edison, so that his revenue from the moving picture-loving public amounts

the moving picture-loving public amounts to \$7,200 per week The action was brought by the vic-tion Pictures Patonts Company to re-atrain infringement, but the defense set arain infringement, but the defense set up was that the company violated the Sherman antitrust law The decision handed down by Judge Noyes of the United States Circuit Court was that the question at issue was patent infringement and not violation of the antitrust law, for which reason he granted the

The Brennan Mono-rail (ar.
A auccessful demonstration was given recently at New Brompton, of the Bren nsn mono-rail car At the trial an 80 horse power generaling set was working The trials commenced with running the vehitle loaded with packing-cases, round the circular track of 105 feet radius at a speed approaching 20 miles an hour The stability of the car under these condi-tions was apparently all that could be tions was apparently all that tould be wished, the vehicle canting over several degrees toward the center of the circle of track. This demunatration was fol-lowed by an exhibition of the facilities afforded by such a par for unloading The vehicle was intentionally titled over on to checks on the right-hand side and note isses unlosted it was then righted and then illicit over toward the left atde and other cases un loaded, being flusly righted again, all loaded, being finally righted again, an these operations of thining and righting heling performed solely with the assist ance of the gyrostope gear. The next irial consisted in carrying passengers round the circular track About fifty pas sengers were taken at a time, and several complete circults of the amenighth of a mile track were made with each load During these runs we timed several During these runs we timed several rounds at species of between 18 and 20 miles an hour. The motion on board was quite phasant the vehicle riding very well. The inward cant that the vehicle acquires when traveling on curves at high speed naturally added to rather than detracted from, the comfort of the passengers Attogether same 300 persons had an opportunity of being on the car riages under these novel conditions. The demonstration which followed showed demonstration which followed showed the ability of the vehicle to take sharp urves, this, however, revealing nothing more than was evident from the earlier trial toward the close of last year. The trial toward the close of mar year the carriage, with passengers on board, was then run backward and forward nt as high a speed as was practicable along the straight with perfect success. The alight lateral awaying under these conditions was quito casy, and free from jerk and lotts, and not at all unpleasant. Th oscillation is of very small amplitude, as the controlling action of the gyroscopes

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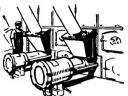




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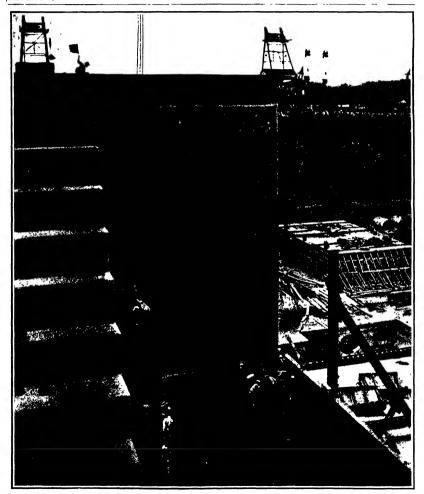
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CHARLES ALLES MINN Profiled PREDICTE STREET THE STREET TONE

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THE PANAMA CANAL AS AN INVESTMENT ONSIDERABLE doubt is being expre ONSIDERABLE doubt be being expressed just now as to whether the Franca Canal will prove to be consucretally a paying investment and in a series of articles, which have recently been jublished Admiral Evons, proceeding siong several rather formidable lines of argument, is sut to leave, at the first reading, a depressing conviction that this great national undertak

pressing conviction that this great national innortant ing can never be self-supporting.

On the other hand, there is the fact that other great canals, such as that at Bucz and the one with his made. Manchester a seajort, were, during their construction, the subject of similar dismai foreled ings Yet Suez has proved to be one of the most profitable commercial undertakings in the history of the world and the Munchesier enterprise, in spits of the few lean years of its curiler op ration is now ac-

complishing sil and more than was promised

it is well to remember, moreover that the admiral s presimistic view of the future is based upon a comsilson of the sailing distincts between tertain trad centers and the two canals and he assumes that upless distances via Panama are shorter than those over the transfer variety and the present route, the new waterway will be power-iess to divert calcing trade from its present fluos of estiling. Now although the principle as fire tall down is broatly current, it should not be forgotten that the connecting of the two great oceans is certain to materially affect the trade conditions along the whole stretch of both the Aliantic and Pacific scaboards of North and South America Indeed, the cutting of the canal may so cularge the tinde and importance of certain of the maritime cities as to render it expedient for shipping which at present uses the Suex Cansi route to iske the longer route by way of the Pannnia Cunal

Pannia Canal
But we should judge of the value of the Panama
Canal rather from the military than the connected
point of view—a fact which is well understood at
Washington where undoubtedly it acted as the con-Washington where undoubtedly it acted as his com-pelling motive in urigin Congress in underlyke this stupentous work. That if 4 mil utile trip of the battle-ship Oregon during his spinnish was was not help lesson, the significance of which has user bern for-gotten. The opining of the canni will render the whole naval force of the United Sintes available in there exem in its ability is eatile a rapid and de-tirible covern in its ability is exiting a rapid and deeither ocean in its ability to strike a rapid and either locality blow at any threshood hint stong the whole of the linite! States senboard the efficiency of our feet will be practically doubled, and the fact that the whole any can in a few weeks thus be assembled in the Pastife Ocean will onermonisty increase the neval provites of the lutted States in the Orient and must inevitably tend to preserve the peace in those must the various program of the program the least in those great Oriental questions which begin to loom so large on the diplomatic horizon. So long as the lathmus of Faunan exists as a barrier between the Allantia and the Pacific we must build at least three intitivalities where others so we would build two, and the first cost where otherwise we would build two, and the first cost of construction and the heavy cost of maintenance and one ratios will for exceed any temporary or even prunnent defail which may develop in the operation of the causi as a commor ial venture

Meanwhib umby the administration of that most ficient lasts, the Corps of Engineers of the United States Army the execution of the work is proceeding a rapidity which is in pleasing contra confusion and disempointment which marked the earlier veers of American occupancy and in the series of striking illustrations of the work which we series of striking illustrations of the work which we present in the present lessor, we are emblied to give our readers an adequate impression of the magnitude and solidity of the permanent works, the most monu-mental concrete structures ever attempted.

RELATIVE REPAIRS ON WAVY-BUILT AND CONTRACT-BUILT SHIPS.

HE wisdom of the policy of huilding at least HB vision of the policy of building at least a small portion of the new ships of the newy at our leading early yards has been and is division of opinion. The principal argument in favor of this policy is that it becomes possible to maintain an adequate force of akilled mechanics permanently at the yards, and avoids that disastrons breaking up the yards, and avoids that disastrons breaking up of the organization and scattering of forces which oc-curs in the slack assess when the annual repairs upon the ships are completed and they have sailed cura 1 for the summer maneuvers. The maintenance of a permanent force increases efficiency and insures that permainent force increases efficiency and maures that the leading yards will be in a position to meet at once the besvy strain which would be thrown upon them in the event of andden bostilities. Of equal import-sance to the question of the effect of new construction in maintaining a permanent force in the navy yards is that of the character of the work that they that of the charatter of the work that they can turn our Conclusive data upon the subject are furnished by those two sleter ships the 'Connecticut' and the Louisiana the first built at the New York navy Jard, and the latter by the Nawport News Shipbuild ing Company if certain disabilities under which ing Company If certain disabilities under which the navy built ship labored, due to slowness in the de livery of armor and the fact that she required special fittings as a flagship be considered, the time and cost fittings as a figgship be consultared, the time and cost of construction may be regarded as approximately the same as those of the ship built by contract. As to the question of the relative quality of the work done, there is no surer test of

of the work done, there is no surer test of this than the amount of respire which have been nude upon each vessels in the four years that they have been in commission. The following figures, taken from the report of the Paymanter-General 1906, their first year of service, the requires on the 'Con-tent of the content of the paymanter-General 1906, their first year of service, the requires on the 'Con-tent of the content of the paymanter of the paymanter of the content of the paymanter of the paymanter of the amounted to \$43.574.74, and on the 'Louisiana' to 89-4. 871 09, and the totals up to the end of the fiscal year 1909 were, for the may built ship \$111,833 58 and for the contract built vessel, \$149 167

In view of the first that during these four years the cost of the repairs for the Connecticut' was about if per cent less than that of the Louislana" what be of the oftrepeated alatement that our yards are incapable of turning out work of the same high quality as that of our private yards?

THE REED OF AN IMPROVED PARCELS POST

HM existing restricted parcels post system of the United States Post Office, as established the United States Post Offere, as established by Congress in 1874 has so far Flutted the casy exchange of commodities and merchan dise between manufacturers and consumers that it is making the United States appear to be wonderfully behind the times as congared with some foreign ma-tions, such, for instance as Engiand France and Cermany 11 is a fact today that an American in Germany. It is a fact to-day that an American in haginard can send home by mail to any part of the lutted flattes in sparred weighing two and one half times more than he intuel flattes limit for about conscibing loss in cost than the present home rates in above words the world pound union package unit is selven pounds to the parcel at the state of twelve cents per pounds to the package at a cost of sixteen cents to the pound. The parcel rate of twelve cents per pound to the package at a cost of sixteen cents to the pound. The parcel rate cost of sixteen cents to the pound. The parcel rate cost of sixteen cents to the pound The parcel rate cost of sixteen cents to the pound. The parcel rate cost of sixteen for the cost of sixteen rates to the pound the parcel rate cost of sixteen for the cost of sixteen rates to the pound the parcel rate cost of sixteen for the cost of sixteen rates to the pound the parcel rate cost of sixteen cost of the cost of sixteen rates to the pound the parcel rate cost of the cipht ceals per pound for a package insured to a weight, but for vorpounds. After that the rate was quistle, but the weight remained the same Bince 1876 the cost of temperature has greatly decreased. The question is, who should not the public through its representatives in Congress to given the besself of this decrease. The presentatives in Congress to give the the selfs of this decrease the property of the establishment of a uniform low postal rate for parents that will oncourage the use of the Post Congress that will oncourage the use of the Post Congress as medius of exchange of commodities, and thus results fortilists trades? rally facilitate trade?

Since the experimental introduction of the Rural Free Delivery system in this country, its operation has proved so great a accessity, convenience and succe ress overlooks the annual deficit arising fro the unreasonable restriction placed in the law lim ing the kind of postal matter to be carried to letters, newspapers, and periodicals. The weight of this avernce load is acceptained to be but twenty-five pounds per trip while the vehicle which the postal agent is required to supply can readily carry two hundred pounds it is estimated that should the restriction be removed and parcels be carried, even allowing only one or two parrels per trip, anough revenue would be re-ceived from the additional postage to more than pay the total cost of this system, and make it self supporting

ent in this direction is the intro a hill before Congress, prepared by the Postal Progress Leagus known as the Bennett Rural Parcel Post Bill, now in the House Postal Committee, which provides

for very moderate postal local rates along, between the city or town and places in a country 1t would enable the merchants mercial center to send, say on telephone en supplies directly to the purchaser niving on and would promote the exchange of merchan tween the residents themselves on the route, as their sending products to the commercial the service would be somewhat similar to the usual postal railway coach and its collection and tribution of mail matter

tribution of mail matter. With the extension of good roads and the use of rapid automobiles, a longer route could be established than now exists, as a maximum distance, which would reduce the number of vehicles required and economise the cost of maintenance

in this connection the experience of the use of the in this connection the experience of the use of the mail automobiles in London is worthy of note. At the second annual dinner of the Royal Automobile and the sociated Clubs of London in the summer of 1909, Bir Henry Norman in a speech alluded to the successe of Henry Norman in a speech alluded to the success, of the mail automobile as a time and money saver is the transportation of mails, by saying that in the sity there were thirteen local motor services averaging thirty two miles a day. There were also ten sets as services in and out three times a day between London principal towns on the outskirts of the city. and the principal towns on the outskirts of the city. In the thirtnen long-distance night automobils must coach services a saving of \$300,000 a year was affected as compared with the horse service which did the sams work only a few months before. The London Post Office is now operating no less than sixty of these motor services.

Results of this cnaracter certainly show that the

establishment of n very low postal rate for purcels is feasible since it will treate more than sufficient revenue to pay the cost, besides saving money for the mer-

whue to pay the cost, besides saving money for the mer-chant and consumer

It is to be hoped that Congress will give such intelli-gent consideration to all matters relating to postal im-provement that the system, so useful and necessary to the people, will forthwith be placed upon a sound busi-

HYDRAULIC TURBING REDUCTION SEAR.

NY TORAULO TOWNITE REDOCTION SEAD.

If the issue of the SHUTTHO TION A WALLAY OF February 17th of the present year, we described the turbins reduction pare designed by McFarland and Maripine in which a mechanical gearing is in irposed out the shafting between the turbine sand the proposity. For the purpose of reducing the economical bight speed of the former to the relatively low economical to the control of ong a speed of the former to the relatively low eco-nomical speed of the inter, and it was noted that a mechanical efficiency of 985 per cent had been secured in the shop tests. Simultaneously with the developat of this gear, the problem was attacked by Dr H inent of this gear, the problem was attacked by Dr. Hyttinger who, with the assistance of the Valcan Works at Settlin, has produced a reduction gear which substitutes for the toothed gear of the MrFariand system a set of hydraulic turbines through which a body of water is kept in constant it riculation, and by the proper proportioning of whose buckets and channel ways the desired reduction of speed is secured. A complete description of this goar with liturations in the complete description of this goar with liturations in the property of the complete description of this goar with liturations in the complete description of this goar with liturations in the complete description of this goar with lituration of the complete description of the goar with lituration of the complete description of the goar with lituration of the complete description of the goar with lituration of the complete description of the complete reference is made for fuller details than are here reference is made for fuller details than are here given The turbine shaft and propeller shaft are in-dependent Upon the former is mounted a rotary pump, which delivers its water into the buckets of a water wheel which is mounted rigidly upon the pro-peller shaft, and it will be evident that by selecting poller shart, and it will be avident that by selecting the proper relative dimensions of the two members, the desired ratio of speech between turbine and pro-peller can be obtained. In its simplest form the re-duction gaze consists of a pump, gratice channels, and a driven water wheel, but in the larger powers one or more intermediate wheels would be interposed be-tween the pump and the driven wheel, indeed trians-formers with one or more stages are preferable while a considerable reduction of speech is desired. With a reduction ratio of between 1 to 4 and 1 to 6 using two reduction stages, an efficiency of from 80 to 82 per cent is secured. This seems low when compared the 985 per cent efficiency of the McFarland with the 886 per cent efficiency of the McParland spar, but the Corman system has the advantage that it is readily reversible. The system has been tried on a small resed of 787 tens, which has been driven by a 500-horse-power turbine at a speed of between 13 and 13 knots. When the reversing lever was thrown over at full speed, the propolers that came to a stand-ctill in 5 accounts, and within 15 seconds that exquired atti in o lectures, and within 15 seconds and sequitions. An inversed speed of between 900 and 185 revolutions. On the shols, it would seem that the German, because of its low sife-incey, cannot compete with the Ameri-can system on ships that make long continuous voy-ages. On channal and river steamers and for tugs and small vessels it has some advantages.

Asbestine, for Fireproof Costings.—Prepare a past like mass of asbestos, powdered allics, caustle potas and sods-water glass. To be burned and sand mite

Scientific American

ENGINEERING.

citization record has been broken in the "Maureanin," which reduced the property of the proper

state where of the steal car as a protection to such the wrest of collidation was demonstrated with states which will be stated with states where states of the states with the states of the states o

divisions seem of Cassiers, states editorially that the first Smith, seamhout was not lettle "Connet," to share Smith, seem of the Cassiers of the Cassiers of the challenges of the Cassiers of the Cassiers of the challenges of the Cassiers of the Cassiers of the challenges of the Cassiers of the Cassiers of the challenges of the Cassiers of the Cassiers of the challenges of the Cassiers of the C

French and contractor, basing his deductions on the recourt French maneuver, believes that the holly submarine will be a "unburersible destroyer" at 2 knots surface and 15 knots submerged speed, or all knots submerged speed, or all the submerged speed, and the submerged speed, and the submerged speed, the submerged speed the submerged speed, the submerged speed to submerged

Roma, tests of the effect of superheating recently made on the American yacht "Idalia" abow striking receipts, When haling saturated steam, the consumpties, of water per indicated horse-power was 183 speamls. This was reduced to 17 pounds, with 17 degreeps at superheat, 188 pounds, with 96 degrees, and to 14,5 pounds, with steam at 100 degrees superheat, this lake being a saving of 18 per cent of steam, a wedly greant-halls showing. The trial with saturated simplyman of two and onequarter hours duration, and with, 356 degrees the test itself for three hours.

divisors of the Public Service Commission, relating to the delays of passanger trains in New York State of the delays of passanger trains in New York State of delays the passanger trains and the year of time at 1900 and
Assumptionant which is being tried on the Hidden and Hambattan Raitrond tumed system beneath the Medican Raitron tumed system beneath the Medican Raitron tumed with much interest by both the raitronade and the public It consists in Himshatted station sizes, placed inside the cars, which are no stranged that the guard by pressing a button white the train starts, rings a buil and causes the right to display the name of the next station right to display the name of the next station right to display the name of the next station size is statistic designated A simple device this, whose widthing has been but used to be displayed until the train leaves the statistic designated A simple device this, whose widthing has been but the statistic designated A simple device this, whose widthing has been but the statistic designated A simple device this, whose widthing has been but the statistic devices the statistic devices the statistic devices and the statistic devices the statistic device

registe sement.

A climations of engineers and scientists is making ast disauptive study of the causes of the revent food in Furit, Superatory to devisite a system of processive "study of the causes of the revent food-the Furit, Superatory to devisite a system of processive "study for the superatory to devisite a plan for keeping the constructions," between the superatory of the superato

The weak of providing absorbate count fortifications has been carried to the point of which they may now he considered to be very complete, at least are not been and emphasisments are consovered. The full efficiency of these fortifications cannot be real-such however, because of the late of proper submaries mine equipment and the proper accessories for the since and given as alward; presided, such as five control apparatus, calculation. The Calve of Onata Artillery agree "Without Lines accessaries the \$17.05.05.06 at a count of the control apparatus, calculation. The Calve of Onata Artillery agree "Without Lines accessaries the \$17.05.05.06 at a count of the control of the size which they are interacted than so many dufficient." To make this provision will require about particular and the control of the c

ELECTRICITY

As the Glidden tour this year will pass through territory where the telephone and telegraph service is very poor, it has been decided to equity the care with wireless telegraph apparatus. This will make it possible to keep in close touch with the contestants, and the latter will be able to report accidents and call for help when necessary

In plants which use a gas engine to drive their generators he writations in speed of the engine are not noticeable if earlou filament lampa are used, because the illement is quite thick and does not respond quickly enough to above any finctuations in light With tungen filaments the light waverings are very annoying, and gas-engine manufacturers have found it necessary to equit heir engines with heavier

A convenient method of determining variations in the candic-power of a lamy was described in a recent number of Riektroscenhischa Zeitschritt. A sidentime reil is semplored, which is exposed to the tamp under test and is placed in suries with a recording militameter. The curve recorded by the militamenter, which is due to the variable resistances of the seletion cell, indicates the variation of the cachepower of the lamp. To be sure, this does not give an accurate photometric measurement.

rate photometric measurement.

A large section of land has been bought by the Commonwealth Edison Company in the northwestern part of Chicago, where two large generating alarment and the company in the northwestern part of Chicago, where two large generating alarment are to be built. Bach station will be goulpook with the tradition of the capacity of each turbline will be 3000 horse-power it is or packed that within two years 6000 horse-power will be in operation. These stations are made necessary the farge that the output of the company has doubled every three years for the last twelve years

Oblogo is trying a new car designed to remove city garbage over the aircer trailways at night. The car is of steel construction, 'th' feet long divided into there sections which are so shaped that they can be dumped with a pole by a single man thus doing away with the necessity of using air cylinders or other mechanical dumping appearing. The sections are well as the construction of the control of the convergence of the control of the control of the control of the car in the daytime for haul long concrete and construction materials

A novel method of recovering a nunken cargo has been adopted by the United Ratios Recel Company A large magnet, 3½ feet in diameter and weighter 3 000 pounds, has been employed in rating kep of latel from a been that was such in the Melloulland at the control of the control of the control of the attle from a been that was such in the Melloulland at keps at a time, or about a ton at each lift. The advantage of this method was that it avoided break ling open the keps as would have been the case had a dredge been need. The magnet is soon to ke under for matsing a nunken load of weven wire, and also for a load of steel baller strips.

Serveral years ago the litthout traction system decided to use sleeping care between Springfield and East Rt. Louis. As this system has proved a success, serveral more cars have been ordered for use between St. Louis and Puoria. Those cars will differ from the first ones in having uo motor equipment. They will be trailers and it is expected that a good deal of the come. The cars will be if for long and will be revolved that the system may compare with though steam; realized as the system may compare with though steam; suffrond service, for the reason that at night one does not care how fast be invade provided he can sleep combridatly and find himself at his destination when he wakes up in the morning

The following subjects with both and up at the International Congrues of Taleshoots and Tabelphon Hall Polyapah International Congrues of Taleshoots and Tabelphon (1) Manual versus automatic systems of telephone working (2) (a) Binapilification of telephone working (2) (a) Binapilification of telephone cruits, (b) telephone cruits, (b) telephone current to the offen waveforms, (c) the circumstances conditionaling the adaptability of telephone current to the offen waveforms, (c) the circumstances conditionaling the adaptability of telephone current to the offen waveforms, (c) the circumstances conditionaling the approach of telephone resistance, etc. (3) Procustoms to be taken for the severage of the conditional conditions of the condition conditi

SCIENCE.

Mr. E. E. Clayton, late of the Blue Hill Observatory, has gone to Buenos Ayros in organize kite and balloon observations under the direction of the Argonitino Meteorological Service

Mast Angström, professor of physics at the University of Upsala, died March 4th. He was distinguished as an investigator of solar radiation, and 'avisad the instrument adopted by international agreement as the standard for measuring the element, viz., the Angström electric compensation pyrhellometer

The International Meteorological Committee, which assembles triennially, will hold its next sessions in Berlin during the last week of September 1310 Dr W N Shaw, director of the British Meteorological Office, is president of the countities and Prof Dr G Hellinann, director of the Royal Prussian Meteorological institute serveiary

The standard trop pound of the Uniderlytis. May revenly isseed by the Burran of Standards and found to be alightly over weight, because of the action to be alightly over weight, because of the action that the standard of t

The Pion bank confrovered will not die Pr. Googe Pr. The Pion bank confrovered will not de Pr. Googe Revenue and Pr. The Was In the famous hast and found it to be a combine that the famous hast and found it to be a combine the properties of the properties of the properties of the proved that the composition is identical with the must could not have been but Vinis Parthermore, he proved that the composition is identical with make the bard Pr. Bode still maintains that the make the bard Pr. Bode still maintains that the make the bard Pr. Bode still maintains that the was of the bank was also provided to the provided that the was of the bank was different from that used hy Loras added to the provided that the was of the bank was different from that used hy Loras of the bank was considered to the provided that the was different from that used hy Loras added Moreover, P. Dec quoies Prof. Lippanan of Italie Talverdity as authority for the statement that the Provider was in the bank was automative employed extended the cuttury despite the belief in some quarrer state the was to know multi 1000.

At the Invitation of the Ro bester Chamber of Commerce and the Civic improvement Cammittee of that tity the conference of 1910 will be held at Rochester May 2nd to 41th American cities are being account to the necessity for n city plan, and for the process of the conference of o

Proc. Pierre Royada, an architect of literons Ayre has devired a special plan for the construction of shole districts of houses for the working clauses and the special plan for the construction of shole districts of houses for the working clauses and the special plant of the special special plant of the special plant is special plant in seaso of the special plant in special plant in the special plant is the special plant in t

NEW TYPE OF TORPEDO BO.A.

A DOUBLE-HULLED BOAT WITH ITS ENGINES ENTIRELY BELOW THE WATERLINE

A new type of war vessel provided for by Congress in the Naval Appropriation Act of last year will be officially tested by the United States government at Bost in within a few days. It is known as the sub-surfa a tope to beat and is designed to be lumnus from the small gun fire now relied upon as a pi tion against ordinary torpido boats. It consists of a a hmarine hull which contains all the machinery and torpid armsment suspended from an unsinkable sur hull divided into compartments packed with

cliut se Last years law authorizes the purchase of this bout when the official trial shows that it fills requirements and the construction under con ty: Ite boat has had a prelim insty trial Tana Lemoine & Cra tle onstiting architects r; ri that it easily n the 18 knots t ir thus exceeding the re-quird speed by 2 knots Bix tons is the weight of the ves-

six tons is the weight of the ves-sel and its length is 46 feet. The tric which life government has age ed to pay is \$22 500. The small subserva to best can either be used for coast defense or they strict on board of the at be strict on board or the intrar vessels in an armored flect in time of a ticn they can be launcied and directed by day or night against tie enemys flect particularly for operation against ships lying under the protection of

land Kriffications or mine fields where expensive lattleships should they were at Manila Santiago and Lort Arthur

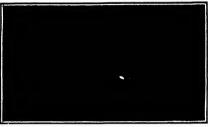
in the submarize hull of the new style boat is an eight cylinder gusoline engine of 1.0 horse-power. The explosive charge carried for use on hostile vessels is 1000 pounds of guacution. An armored couning tower on it surface hull communicating with the submarize hill chables the navigal r t dir of and control the boat s movements. Only two men are re-

It is extimated that a fleet of fifty of these subse torpodo boats will cost about as much as two ree destroyers or submarines. As their cruis surface torpodo boats will cost about as much as two or three destroyers or submarines. As their cruis ing radius is 200 miles their principal fun tion will probably be for the defense of ports and unguarded

surface boat is to be operat The subsurface boat is to be operated in one of two ways I lither it may be stoered within short lorpedorange and almed at its objective the crew leaving it in lifeboats or buoys or it may be fitted with a sub merged bow torpedo tube to discharge the ordinary

For the firing of the high explosive use is made of an electrical firing (ir uit which is actualed by a bow firing pin but which is kept open and safe by a switch in the canning tower until the boat is deserte in the centility tower until the post is deserted at as also prefered to continue the firing (ir uit around the inner skir of the upper buil below the water line so as to explode the charge if the boat should be rammed, deler hoslife boats from ramming Also It is proposed to use on the engine sparking circuit a time swith whi h will automatically break the sparking circuit and stop the engine and boat if it misses its

type is \$46.000. When the first is approved the Nary Department is authorised to contract for two others, one more of the amen sizes and one larger and faster—a \$40.000 subsurtace seagoing destroyer.
A year or two age the Austinat Secretary of the Nary recommended the building of a number of small motor torqued beast of approximately the satise size as this to be laid up on above in peace time for one of the secretary of the se



THE SUBSURFACE TORPEDO BOAT OF ITS TRIAL TRIP

than has been achieved by the present subsurface boat on its preliminary trials

on its reliminary trials
The English motor torpedo boats huilt by Yarrow
with Napler engines make about 18 knots. They are
of about the same stae as the vessel we are describing
and are used for the same purposes. It would appear
therefore that no greet has been into thy carrying the
contines and torpedo below instead of within the buil
of the boat. It is assessment bethef to where of the comof the boat It is suggested that in view of the com paratively small expense several fictilias of these boats could be distributed along our coasts and laid up with the engines greased in which condition the expenses

the engines greased in which condition the expenses of maintenance would be very small.

There can be no doubt that all the navies of the world are just now directing special attention to sub-surface warfare and the trails of this boat which of fore some decidedly valuable features in the great protextion afforded both to the motive power and the high explosive will be watched with no little interest. The general design of this very interesting craft is

due to Cisrence L. Burger OE of New York and the plans (alculations etc were made by the Naval Architects Tams Lemoine & Crane

The Oldest Attle L

The otions and the tester

A little seader table tarnbade upy and otherwise
trivial in appearance was sent a few years ago from
Athesa to the imperial Museum of Berill On one
side of it is some writing which only recently was
deciphered with precise corrections by Adolph William
an Austrian scens who lives in Athena The tablet
is the original of a private letter that was written
about the time of the orator Demonthenes
about the time of the orator Demonthenes
The writer of the latter lives in a rural neighborhood
and wished to send a commercial order to a town

The form of the address was ... To be taken to good potenty market and to be handed to Nansian, so star Thrawylkies or to the son (perhaps the son set disk writer was meant). The weakly market, to which the hot was a substance of the butter was to had the awares for asis may be imagined as in progress. These has you was becare of the latter was to find the stand or book do not be the proposed of the property of

y with the name estem and wishes them good bealth, and he says also that his own health is genet.—Please he so kind as to send limit, and he so mantle either of the spatch or of goothich and let it be as cheap at possible for it does not need to be trimmed with fur Send with it apir of heavy sole also Ass som as I have an opportunity I will pay you.

pay you. So much for the letter to the So much for the letter to the motive of which the reader can point with as much precision as the author Apparently it was written in winter poor Muselerges having been surprised out in the open country by one of those key open country by one of those sey snowstorms which sometimes even at this day cover the temples of the Acropolis with a mastic of snow Therefore he desired to re-

mow Therefore he desired to re-colva sa quickly as possible the heavy and warm garment of the poorer countryme a granten which could be lought for four and a half drachmas and the strong soles which were worn under the or-dinary sandais on the rural plains and billaties A good pair of the lister could be bought for four drachmas as a well preserved bill of that date shown. A notworthy feature of this arthue stetur is the

A notworthy feature of this arthess ister is the formula with which it begins the very formula that may be found used in very numerous feiters that were preserved by the Greek literature of later gimes. Zeon at the present day swary letter written by a creat Greek begins with the same contail inquiry about the bestlit of the person to whom the later in writing and with brief information about the boath of the

Although it is possible to resolve into gas almost any kind of solid fuel in a gas producer it is well known that certain rues—particularly those high in ash and of a caking character—give a good deal of troubles. One of the most serious of these troubles. tround. One of the most serious of these troubles states a contemporary is that the Fusi walds itself into a large mass which partially choken the fire in some places and causes peaages or holes to be burnt at others. Hence poting of the fire is necessary and the poorer the rues the most the poting in order to reduce this point to a minimum nous In order to reduce this pointing to a minimum some producer makers fit shaking or revolving grates. The latest design of this character is due to Mr Chap-man an American and it is a considerable extension of the principle. The lower portion of the produces is divided into two or three rings which are free of is divided into two or three rings which are free of each other and rotate at different speeds the jessie between them being made by water seals. The ob-ject is to shake the fuel continuously so that calding or clogging and holes are equally impossible.



the and therefore out of pixels of the country's projective. The approximal, being to paid when it was within religing theorem the playing of the upper locally projections by height consisting the Adv. This little coult, 46 feet 9 increasi long searches its war hand and oughness in filled with publishers, in designed to be made ignite. In expediting from combasied, leaffure the rehe heat troubly be driving at the upday at \$10 fell spined of 1 for any increase the best to strategy his change of \$1.00 page

TRACES ELECTRIC TROLLEY-DRAWN SLEIGH IN NORWAY

BY FRANK C. PERKINS

chiragevice during the past win-

The news construction of the trackless trolley car this A. S. Dommeter Maktriske Bane is shown in

tier ig, Sheweg as "shewes he had been controlled to tracking to the controlled to t

livery winter the demand for fresh eggs becomes more instituted and more difficult to supply Foulity breeders in different parts of the world have en

deavored to supply the deficiency by artificial selec-tion. By this process an Australian breed of fowls which averages 270 eggs per hen per year has already been produced. A series of very interesting experi-ments on the same subject has been carried on during nests on the same sunject has been carried on during the past ten years at Macdonald College, in Montreal, which is reputed to be the most perfectly equipped school of agriculture in America. Starting with hreeds noted for their endurance of cold, especially



A PASSEFER SLEIGE DRAWS BY A TRACELESS SLEGTRIC TROLLEY

Plymouth Rocks and White Wyandottes the experimenters began the process of selection by allowing the fowls to leave the poultry yard and arratch in the anow in the celdest weather The progray of the fowls which availed themselves of this privilege was rows wink a valued teamment of this privince was subjected to similar treatment which was continued for several generations. The poultry houses were not heated, even when the temperature fell to sero Fahrenheit, although the fowls were slightly protected from the cold by scrosse placed around their perchast of the poultry pards were covered with a layer of straw

a foot thick, upon which wheat or millet, the only food a foot thick, upon which wheat or millet, the only food given, was strewn at requiar hours. The bens were kept busy from morning until night in hunting for their food in the straw. This active exercise pre-venied the accumulation of fat and stimulated the production of eggs, for every poultry farmer knows that fat hens are poor layers. Hence, as hens, like all other birds, naturally store up fat at the approach of winter, the problem became limited to preventing this ac-

cumulation of fat, and at the same line ascumuation or list, and at the same lines as-suring to the bens an abundance of food. The problem appears to be in a fair way of solution for the hens of Max donald College produce an average of 500 eggs per year, from one-fifth to one-fourth of which are laid during the rigors of the Canadian

The removal of ashes by conveying them to a waste bank hydraulically is done in connection with the temporary plant built to supply power during the construction of the Rainbow Falls bydro-electric development of the Great Falls Water Power and Townsite Company on the Missouri River near Great Falls Mont The power house is on the side of a hill directly above the edge of the river bank. The bituminous coal on the side of a hill directly above the edge of the river bank. The hituminum conti-used is dumped by gravity from cars on a trestle to a bin at the rear of the firing floor of the boller room and runs down on this floor, from which it is fed by hand to the furnaces As the asies fall through the

the furnaces As the sales fail through the concernite they are drawn out into a transverse concernite they are drawn out into a transverse concernite the sales of the sales of the sales is aloped to no sale of the building, where it connects with a funne extending on a grade of about 5 per cent of the sales are pulled into the trench and a cleaned the ashes are pulled into the trench and a hose stream thread into the latter to start them. They are thus picked up by and carried out in the river through the flume No difficulty is experienced from clouding in the trench or flume and the current in the river prevents an accumulation at the edge of the

THE EARLIEST STORY OF THE DELUGE

PROF. HILPRECHT'S REMARKABLE DISCOVERY

th more so in fact than any or caselform version thus far

One of the meet remarkable discoveries which has ever been made in Amyriblegy, a discovery which resours been made in Amyriblegy, a discovery which resours greatly to the seedle of the University of Pennsylvania and to the evedff of Frof H C Rilprecht, is the indisting of an account of the Babylonian Deluge which antedsites any Debugs narries extant. The significance of the discovery is enhanced by the fact that is the most important designing and the seed in the seed i



FRONT AND ROCK VIEWS OF THE NIPPUR VERSION OF THE DRIVER.

BATE APPROXIMATELY, 2100 R. C.

cued Lot from the hands of Amraphel of Shimar and Chedorisonier of Elam (Genesis 14) Furthermore in its preserved portion it showed a much greater resemblance to the Biblical Daluge story than any other fragment yet published.
The cunelform text of the frag

ment contains a portion of the di Nosh III us plahtim to construct a ship and to save life from the ail desiroying flood. Apart from the tradition of a great flood handed down by the Babylonian priest Berosus (living between 370 and 250 B C) but preserved only in ex tracts by other ancient we there are fragments of three writers tinet Deinge versions in canelform

The first of these is the version from the library of King Ashur banapai (658-626 B (*) which was restored from a number of frag veh. and which is an Assertan con-

veh, and which is an Assyrian copy of a Babylonian original.

The second is a somewhat dif-ferent version of the Babylonian betuge story and is found on Fragment 'D(ally) T(clograph)

42," which likewise came from the royal library of Nineveb and was inscribed about the same time to 850 B C)

The third fragment is that acquired and published The taird regress is that acquired and published by Prof Scholl of Paris, and now in the possession of Mr J Pierpont Morgan It is dated "in the year when King Ammi-aduga at the mouth of the Kuphratos," is a, the elevants year of his government, in other words, according to Prof Hilprocht's reduced chronology, about 1958 R.C.

An examination of the canelform text of the Alpput fragment and a comparison of this new version of



the Babylonian Deluge story with the parallel pas-sages of the two Nineveh versions and the Biblical morr nave brought out the significant fact that, with all due allowance for a general resemblance between the three cutefform versions, the Nippur version of the drine amouncement of a great food and the command to build the ark differs fundamentally from the two Nineveh versions and agrees many command to build the rack differs fundamentally from the two Ninevah versions and agrees most remark-ably with the Biblical story This agreement affects that part of the Pentateuch (Gen 6 13-20 8 11) that part of the Pentateuch (Gen 6 13-20 8 11) which Dld Testament critics style P (==Priestly Code) and generally regard as having been "compiled in Babylonia about 500 B C" The importance of this new text to theological students cannot be overrated Written as it was about 2100 B C, this new version came into being at a time when the sanctuary of Eniii at Nippur was supreme among the Babyionian temples and was the center of literature When Hamnurabl, the Amraphet of Genesis 14 conqueres Sin of Larse, the various petty Sabylenian stat Blu of Larms, the various petty Babylonian atakes con-stituting geographically the speciest kingdom of Buu mer and Akkad were united politically by the con-queror Babylon on the Euphrates became the me-tropolls of the united empire After Ammidilans the third successor of Hammurahi Nippur disappears third successor of Hammurshi Nippur disappears rapidly from history. It respiesars with the rise of the Casalle dynasty in Babyloula about 1400 H.C., and its sanctuary again rises to hold a conspicuous place for several centuries. The revival is but the last

in Prof Hilprechts opinion the Temple Library at in irror illiprents opinion ino remide Library as Sippur was a most insignificant institution after 1000 B C, and it flourished most gloriously before 2000 B C' The priests of the Casalic and No-Babyinnian periods produced few, if any original literary comperiods produced few, if any original literary com-positions of value at Nippur

mere delighting in the state-ment of the end of their tabmen at the end of their tan-faithful copy of an old Nip-pur original. The literary activity of the priests was erred to other centers like Rabyion and Sipper It is therefore evident that the is therefore evident that the Nippur fragments, antedating the two Ninevel versions by 1500 years, represent the old est version of the Baisvionian Deluge story in a Semitic translation, made doubtiess from a much older Sumerian original which has not yet been discovered and that the inter tunesterm versions are different editions of the same story with consider-able changes, abbreviations, and additions The Deluge atory of the so-called "Priest iy Code" must form part of the oldest Iraditions of Is

Even the Amarna period (about 1400 B C) with its unsettled conditions in Pa

line, when the influence of Babylonia upon the shaptine, when the influence of Babylonia upon ine shap-ing of the government and the religious conceptions of Palentine was simost sit cannot explain its pres-ence. In the Old Testament. The only period when the oldest version of the Deluge story could possibly have entered Canaan was the time when Abraham, whom Prof Hiprocht rigards as an historical per whom Prof Hillpreat regards as an ansortes per sonage, left his home on the Euphrates and journeyed westward, in other words, the period of the first dy nasties of isin and Babylon of which Hammurshi or Amraphel is the rentral figure, the lime when the Amorites knocked at the gates of Bubyionia, invaded Although the interpretation of the Nippur tablet

nenns easy it can be stated with safety that is by no n in accordance with the exaited position held by Entil in accordance with the example position from y some in the old Babylonian pantheon as "father of the gods" it was in all probability Enlit himself who warned [1] ne-pitabilit to take refuge in an ark Here then as in the libitest version, the Lord of the Uniin the then as in the Diblical version, the Lord of the Unifrom destruction by warning him and ordering the ruction of an ark

We present herewith in paratiel columns the trans-We present herewith in parallel columns the trans-lation of the actual preserved portions of the ancient Nippur version and the corresponding passages of the Old Testament according to the Rebrew text. The similarity is at once sirking as much so in fact that the blanks in the Nippur version can easily be suppiled by the more complete account

I will londen."



The shall every for 0.11 "soled, I will de-tuke) away all men to stroy them with the earth." 4 He (1) before the griber

4 life 17) before the deluge consols forth

1 (over! 'as many as
libero are, I will bring over
librow, destruction annihila is "but with thee I will establish my covenant" 17 and behold I do bring the delays upon the caria in destroy all feels, wherein is the breath of life, from under heaven, every thing that is on ourth shall partials

thing that is on ourse events profits had been as ark. '

17 and thus thou sheat had been as ark. '

18 and thing thou sheat had been and thing could be a least the same and thing could be a least the same and the ark shall thou at in the side and third stories about thou and in the same and third stories about thou and form every living the same and the i theild a great ship and"
7 'total bright shall be H 'It shall be a none-beal carrying what has been saved of libe.' with a strong reef over

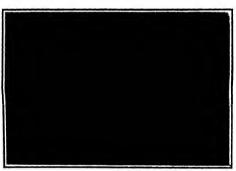
and a stories shalt thou to hake il 'and from every living thing from all fieth two from everything shalt thou bring is to the art, to keep them all with thee, they shall be main and female." 10 (the boat) which those shall make

wan mee, they shall be male and female:
20 (two) from the birds in the birds of a number thereof, as a number thereof itso) from everything creeping on he ground instead of a num her thereof.

18, b 'and thou shall come the state of the ark, thou and thy sense and thy wife, and thy sense and thy wife and the sense wife with these. 19 and family"

The Current Sup

The current Supplement, No 1787, contains a most markable number of interesting articles. Karlorn romarans number of interesting articles. Agricultus Knatz writes on the modern use of police dogs, and R W Haymond on quantitative and qualitative thick-ing. Prof R. 8 Woodworth deals interestingly with the "typical" man a creature who does not exist, but yet who is very necessary in the endeavor to classify



THE SOC-HORSE-POWER BENE BACER IN WHICH OLDFIELD MADE 190 89 MILES AN HOUR. A NEW WORLD'S RECORD

A prominent place among the physical enenkind manking A prominent place among the physical agents employed in moders mothods of therapeutics has been occupied for the past decade by light and ospecially by electric light, which is used chiefly in the form of "light baths" and is furnished by are and super-tally by electric light, which is used chiefty in the form of "light baths" and is formshed by are and incandescent lamps separately or in combination. Dr. Theodo: Schueler reviews these modern thera peatle agents in an article sattled "Electricity and Light in Modern Meditise". No mans is more dis-consistent of the second of the second of the Prof O E. Isla, the foremost authority in the world on the sun He centributes a brilliant article on solar vortices and magnetic fields, in which he criti-city discusses revent total revestigations, and par-ticularly his own wonderful discovery of the Zeenan effect in autopoit in electric research, as is less ambitious affairs, the possession of a good imagine fret in autopoit in electric research, as is less ambitious affairs, the possession of a good imagine fret in autopoit in electric research, as is less ambitious affairs, the possession of a good imagine fret in autopoit in the evolution of outstand-ing achievements, there are equality few in which the authors of these advances have not oved a large measured their encoses to the happy inspiration of their limaginations, all of which is discussed in as article scalind—"described Guessession and a trick entitled "described Guessession" in the review of the production of the proposession of the river being triding as compared with the volume of tall water rebing and flowing between the pleriesed. The pocular conditions of that port have accounted a vater area of a rever he account of the comprehend, will add 40 acres to the total. This remembrable scheme

Season, A. 1985.

In described by C Van Langemeitsche 1961: Le Signative vrites on medern development in the large single flow motives. Among the very units is defined vallet doing nontrease and the scaches of season of the state of the scale of the sc

NEW AUTOMOBILE RECORDS AT CRIMOSD REAGE.
Once again the famous sands of Ormond Basch have
been used for making new records with automobiles. been used for making new records with automobiles. During the three days meet beld insit week Barney Oldfield once more beat the world's record for appear with his new 200-horse-power Bean racers, a picture of which is reproduced herewith. This machine broke

which is reproduced herewith. This machine broke four world's records last fall upon the Brooklands track in England, and so it is not to be wondered at that upon the smooth sands of Ormond it traveled two mises in the fastest time ever made by an automobile The disce was covered in 55 87/100 tance was covered in 55 87/100 seconds, which is nearly three seconds better than the record of 58 4/5 made by Demograt or as 40 made by Demogeot in 1996 with a Darrosq car The rate of speed traveled by Oldffeld is 12878 miles an hour Oldfield also made new records for the kilometer and the mile; he covered the 3,280 feet of the distance in 1,20 feet of the first-mentioned distance in 174/100 seconds. The previous record was 1776/106 His record for the mile, which was made a week previously, was 27 38/100 sec-onds, a speed of 131 72 miles Walter Christie's front-drive ra er covered this distance in 30 19/100 and or at the rate of 118 46 miles

an hour in the stock car races, Old field made a new record of 40 25/100 seconds for one mile in a Knox machine. This make of ear also won the 10-

in a know macane. In is make or car also wun ner cum is recorded in 8 41/100 ministers, a Chaimers 40-borse-power car took second place, the 10-mile hand-cap was also won by a Chaimers car, which best the Pope-Rartford, the time being 12 minutes and 13 seconds. On the last day of the meet, in the one-mite speed trains, Odfiled covered the distance in 27 85/800 minutes and 15 for the condition of the condition o ids. The 10-mile stock chassis race for cars hav ing a piston dispiscement of 161 to 230 inches won by ifart in a Buick in 12 minutes and 58 seconds, or at the rate of 46 27 miles per boar A Bud-son machine came in second in the 10-mile hands-cap a Darracy are driven by Kinscher wom in 7 21, Oldfield on a Knox was second and Boad on a Stears third A second 10-mile handicap race was you by Altran or a Hudgen in 12 4 Meteory and 10-mile handicap

third A second us-miss nandicap race was you my Altiman on a Hudson in 12 46, Udifield with a Knex was again second, and Kiracher third. In the one-mile speed trials the Darrace covered the distance in 37.34, and Walter Christic made it ha

Shalls while the races this year were not very numerous.

Oldfield created a great deal of enthusiasm by his year Oldfold created a great deal of enthusiasm by his pro-ord-breaking driving, and it is probable that next year still other attempts will be made to reduce the time for short distance. The machine Oldfeld used fat he wary way similar to a requiar stock car except, that it has a much harper oughte of 15% x 300 millituesters (7.3 x 7.3 inches) bore and stroke, capable of develop-ing considerably more than its rated horse-power.

A large portion of the old French plant at Panama was found to be serviceable, and is deing good work on the canal. Since 1960 the unders past has been sold as zerap, and up to January, 1910, owne ten they used tone have been shapped spid and.

Scientific American

ARRIL 2, 199h.

The Redemins the Reserve of the Rarch, Receiping the degree of the Rarch, Receiping the degree of the Rarch, Receiping the degree of the State of the service and decompositions of the Interior of the earth have been an object of bright and instituted discussion, and the Rarch of the State of the Rarch of the search by means of which may be treated and the search of the globe, which as they meaned on the search of the search by means of which may be received, and with it has busined the fancy both of expert and of layeans. As is saddly further vivid increasing temperature in control the fancy both of expert and of layeans. As is saddly further vivid increasing the search of the same of

at this depth a tempera-ture of 50 deg was as-certained. If this man-ner of calculation be-continued for greater degrees of depth the im-mediate result is that already at 60 kilomefors, approximately the approximately, the constituents of the crust of the earth are in fery so-intion, and at 300 kilo-meters must be in the form of gas. The latest investigations conducted by Meyer remind us of the research of Tanuman stituents of the crust of the research of Tamman and others and of the results of experiments made to measure the speed of the progress of waves of seismic dis-turbance. The collective turbanes. The collective result leads to the con-clusion that the real first crust of the earth cannot be specifically thicker than 100 kilo-meters. Among the phe-sorman systellary this Among the phe-

meters. Among the phe-geogene settating this conclution is the so-confided magnes which is occasionally expelled in a vol-sight exception, when namer to the conter of the earth \$\frac{1}{2}\$, and \$\text{th}\$, and \$\text{th}\$, and \$\text{th}\$, and the set of any, but there each superior-signment that the (umportants of the center of the signment that the (umportants of the center of the signation of the significant of the center of the signation of the first of the significant of the center of the signation of the first own of the significant of the signature of the president of the first own of the significant of the signature of the signature of the significant of the significant of the signature of the significant of the societists of it must be noted there-they, significant he acceptance of the centh depend the significant he acceptance of this, these are ac-suring for an indefinite time at least.

An Bruption of Russ.
On March Sith the Skellian volcano Stna began to rapt. The lava united in a vast stream 24 feet high and 1,900 feet wide, and at the time of going to press was threatening the destruction of Belphano and

The lava devastated large tracts of sultivated la The lave devastated large traces or outstrated labes, such as rineyards and orchards, and has wrought haven in the woods. The village of Nidolo, near Nico-les, has been covered completely, and many lasts and head of the laws have described. MULDING THE HUFE CONCRETE LOCKS AT GATHN. PARAMA.

IAL APPLIANCES BY WHICH THIS HUGS ANTIPICIAL

MONORATOR, 400 PROFE WIDE, 4,000 PROFE LONG, AND 30 to 100 FEET DEEP, IS CONSTRUCTED

The work at Panama, and particularly at the great

The work at Panana, and particularly at the great light of double looks at Gatu, has now reached a stage at which the camera is able to catch some advants impression of the titland proportions of the work and record it for the laterest of the outside world. We have all understood that the scale upon which work was being done at Panana was impressionable to the stage of the scale teach us just how stupendous is the mass of masonry which is slowly taking shape near the Atlantic end

The locks at Gatun will pass vessels up or down The locks at Gatun will pass vessels up or down between sea level and the lovel of the lake which will be formed by the great Gatun dam immediately ad joining the locks. The total height of 85 feet will be covered in three flights of approximately 28 feet be covered in three flights of appreximately 25 feet, each, in order to provide ample accommodation for future florense in truchs, and also as a contingency florense to the control of the control of the built in duplicate, as shown in the plans beswith presented Each lock will be 150 feet wide, and will have a usable length of 1,000 feet. To provide against the carrying away of gates and the consequent rush of water out of the lake the former will be built in mum of 18 to a maximum of 23 feet, the size varying according to the number of side culvers that are served. Now it can readily be understood that the coat of a work of this kind, involving the handling of 4,000,000 cultic yards of material, depends very largely upon the amount of labor involved. For in the coat of t largely upon the amount of labor involved. For In-works of this character the cost of labor is the prin-cipal item, and hence much thought has been given to the design of the appliances for handlin in con-crets and the huge "forms (temporary in leating walls) within which the concrete is deposited. At the Gatun locks the sand and since are deposited the Unitude notes too same and sione are especially from cars in a stock pile running parallel with the lock site. On either bank above the buge excavation in which the locks are being built are a series of lofty sixel towers (see front page and Piga. 2 and 7), between which are strung heavy, steel cablos, by which the buckets containing the materials are transported The concrete is picked up by these cables run over the excavation and lowered at the desired point. The first part of the concrete work consisted in

The first part of the concrete work consisted in the laying of the huge slah of concrete, 302 feet wide and nearly 4,000 feet long, with a maximum this knew of 20 feet, which forms the floor of the locks. Dur-ing the construction of this floor, care was taken to provide circular transverse conduits with vertical openings through the floor which led alternately to opposite side walls, there to connect with the main longitudinal, emplying and filling condults. The next task was to erect the side

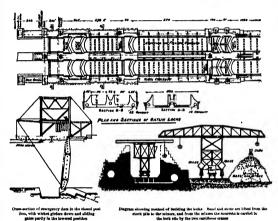
walls, and it is this in-teresting work which is shown so clearly in the tion

The walls are built in sections, each of which is about 40 feet wife, with a space of about 30 feet between them. The wall is then completed by filling in the interveb-ing vertical gaps It is well understood

that one of the most ex pensive elements in con crete construction is the building and manipula-tion of the forms in which the concrete wis in smaller structures those are composed of timber, but because of the huge amount that would be required and would be required and the big depredation in the value of the timber after use this material was situgether out of the question 1 be pisn adopted is shown very clearly in our lilustra-tions. The forms are built entirely of steel (Figs 2, 4 and 5) Those for the liner ver tical face of the walls consist of a sories of massive steel towers of

massive steel towers of trinagular cross-section, to the vertical fare of which is rivered a wall of steel plating, stiffened by herisontal channel irons. The towers are carried upon four 4 short receipt, we under the fresh and two under the read for the first of the four the four the four the four the four the four of the four the fo crossed by a series of separate rectanguist forms measuring about 6 feet on the vertical and 4 feet on the horisontal face. The ends of each wall section are closed by means of sivel plates supported against vortical movable framework into the pocket as thus formed the concrete is dumped from the skips of the overhead cable, and tamped into place by the laior ers, until the full 5 feet of height corresponding to the height of the rear stepping is completed the height of the rear stepping is completed. The walls are thus carried up three at a time until they have reached their full height. This work is very clearly shown in the front page engraving, where a skip is shown as having just delivered its load and skip is shown as having just delivered its load and the laborers are spreading and tamping the concrete To amist in making a firm joint between the mono-lithic sections, vortical and horizontal key ways or pockets (Fig. 5) are formed in the abutting faces, poches (Fig. 5) are formed in the abuting faces, which pockes are, of course, filled in with rescrete as the intervening spape between the walls are built up. This system of keying, coupled with the instural adhesion of the concrete, will prevent any incheaps to creaking or separation of the walls at these points under hydraulir or separation of the walls at these points under hydraulir or search pressure or under the rack ing strains of an earthquain shock.

A most interesting piece of steel form work is that



How the 4,000,000 cubic yards of concrete are being mixed and built into place at the Canal locks BUILDING THE HUGE CONCRETE LOCKS AT GATUE, PANAMA

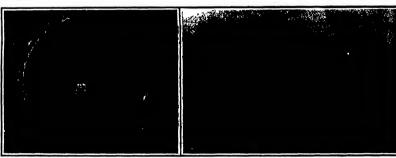
duplicate, with a considerable space of water i them, so that if a ship, overrunning, abould strike the first gate, the second will remain intact. Also, them, so that if a ship, overrunning, about strike the first gade, the second will remain intact. Also, at the entrance to the upper lock, there will be a huge swing bridge which, in the event of the gates being certed away, can be swung scross the lock entrance, and a series of horisontal, vertically sild

being carried away, can be swung across the look cutrance, and a series of horizontal, vertically sild ing steel gates lowered down from the bridge, than dectually skilding steel gates lowered down from the bridge, than dectually skilding and the state shock of a collishen and thus, partially in at along thee, absorving the momentum. But the present story is concerned with the method which have been adopted for building this bege monolithe, or unjointed, mass of artificial manour; into the construction of which will mater about four million cutler yards of concrete in general, the locks and yet the state of t Excel are paid on an incine and are supposed, or berisontal thickness increasing with the depth of wither in order to resist the lateral pressures Possible in suppring and filling the looks a series of transverse collects, formed in the floor, lead to large longitude theat selverts in the base of the walls (Figs. 1 like 3), the later ranging in diameter from a minifor forming the 18 10 22 foot conduits in the side waths 11 consists of a thexibic steel pipe (Fig. 1) heavily braced to redst deformation, while has a longitudinal hinge at the top and at the bottom is provided with heavy left and right see as by which provided with heavy jert and right serves as where the form is kept to the full dimension during the lay-ing and setting of the control. For remove the forms, the serves in turned and the bettom edges of the form are drawn together thus reducing the dimension and allowing the form to be drawn clear of the

conduit
A ment interesting picture is Fig. 3 showing the
work at the entraine to the looks from Caton dam
forth, right is seen the rear stepping of the easterly

wall of the estately lok The circular timber work shows the position of the upper end of the first lock. Just beyond this are two sections of the steel forms for the main central conduit by which water will be left from the lake to the upper lock. Just beyond the wall which extends across the picture to the right hand bank will be located the amergency dan above reterred to, and beyond that will extend the three piers with will form the lock entrance from the lake. The embantment which will be see resulted to the contract of the contract of the contract of the contract of the of the state of the contract of the con out as an extension or the natural mans to the right of the picture is the rock fill forming the south-crip toe of the great Gatun dam, which extends to the right across the valley to a junction with the

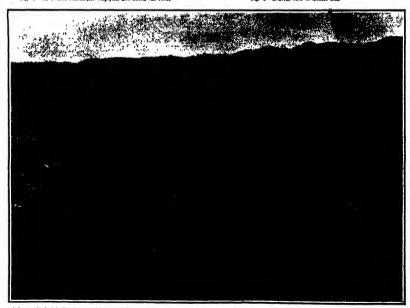
distant hills. The lake of uning uses to the right of the rock embantment is feptical by the hydratile dredges which are being using in making the Gradus with a read of the locks, and the making the Gradus dam. Half a mile to the negrip, also extending across the railey from the northerly and of the locks, as similar rock fill, and hum dredges are now engaged in pumping all and waste from the Chagras and from the various contiguesse channels, into the highest half as mile wide and over a smite long the basin half a mile wide and over a smite long the basin half as mile wide and over a smite long leaving the fine silt in a firmly companed, impressible mass, which is so dense that it will be impossible for the waters of the kinks over to seep through. If the reader have sufficient imagination be can, by



be conduits are furned in the body of the side and center walls. The forma-inguith sire! ryllinders, bluged at the top split at the bostoms and kept in right and left series. The latter are loosened when the concrete has set the two haives of the cylinder to rwing inwardly and he withdrawn

Fig 1 An 18-foot conduct, for emptying and filling the locks

Fig 2 -General view of middle lock



it for diling the looks. Beyond the wall will be the emergency date and the entrance plans, which s too of the Gaten dam. Back of it are the water and sit, which have been

Fig. 8 -General view of south and of Gatan looks

ag at this picture, fairly depict the scene as it appears when the canal is completed, supposing, urns, the side wall were broken away to give him popularisated view To the right the bank will as unpeltracted view To the right the bank will be shat of the best of the walls of the lock structure, and to the left he will set the three concrete piers estanding fine out hint a wast lake of water which will cover shift the space now occupied by tracks, telegraph time and embankments, and will extend in an unbroken eaginee until it reaches the hills in the far distance.

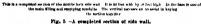
Efficiency of Minim Tarbles Rendes.

Some experiments upon steam turbins nossies, expanding steam from ordinary boller pressures to condenser pressures, are described in a paper presented to the American Society of Mechanical Iong, neeth by Prof. Silbley and T. R. Kemble I he main results are worth nothing, and confirm the inlaim ands for the efficiency of nossies by turbins makers Efficiences of from 90 to 85 per cent were regularly obtained. The actual discharge from the nozzie,

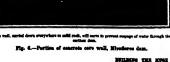
stated as a percentage of the theoretical discharge, was of the same order as the efficient less. Most interesting however, was in apparent tack of influence excepted by the form of the housile even when this might have been expected to be considered, as, for instance, when the section, changed from it cuits at the neck to square at the disk major or when a conical noedle protrusted into the norrie from the latter and Smoothness of surface was, however, an important factor

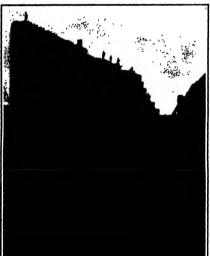


Fig 4.-Steel forms in place for building center wall,









The gaps will be filled with concrete, keyed and comented firmly in place, thus providing a con-tinuous monolithic wall. The steel angie plate forms are already set up across the further gap Fig 7 -Sections of easterly side wall, upper lock

HE HEAVENS IN APRIME

BY HENRY NORRIS RUSSELL PH.D.



E great conkt which was so can apicuous in January is again observable in the morning sky, just infore daylight but only with telescopic aid Its orbit is now well determined and it apnow well determined and it ap-pears that it was nearest the sun, at a distance of 10,000,000 miles, about the time of its greatest brightness, and that its

and fading was due to its steady recession from and roung was due to its sleady recession from both anth and sun its orbit is probably very nearly peraboth. That it could not be of short period was clear at the time of discovery for so bright an ob-ject could not have eastape being seen often before, if it had come around at moderate intervals like Halley's comet

The latter is invisible behind the sun during the early part of April, but is well placed for morning

time it appears almost statime it appears almost sta-tionery in the heavons south of the eastern edge of the great square of P games and in high crough to be observed be-for 4 A M its distance from 168,000,000 rolles on the state of 77,000,000 on the 5th and the squarent size. With and its upparent also as d brightness will stead-ily tucrease By the end ily increase By the end of the month it will doubtless be conspicuous to the naked ove

While waiting for this, we will find abundant ocrupation among the stars. Hefore we trace out the Hefore we trace out the constitutions into which the imagination has grouped them, let us study a real family of stars, whose relationship has but recently been discovered. It has stready been told in these columns how Prof. Boss has identified

about forty members of a group of stars in Taurus which are keeping to-gether in their movement through space like a flock

of wild grose in the air

It has also been known
for some time that five of the bright stars of ti Great Bear form a similar group, and recently, German astronomers, i,u-dendorff of Potsdam and Hermprung of Göttingen, it has been found that several other conspicuous tars, in different parts the sky, also belong to it. All these stars are really moving in the same direc-

moving in the same circo-tion, and at the same rate, and hence they all supear to be moving away from the same point in the heavens, though in quite different directions, for some pass our system on one side and some on another. They

though in quite different directions, for some pass our system on one side and some on another. They ought on this hypothesis still to be approaching un, and the spectrosops shows that this is actually the case the observed varieties of approach agreeing. The stars of this ayeine are shown on our map First comes the group in Uran Major—the stars for, and, all if in the Great Disper—with Alery the small companion of Missr (2), and also two other stars not shown on the map, one of them should take the stars of the system of the same of the stars of the stars of the system of the same of the stars of the stars of the system of the same of the stars of the stars of the system of the stars of the stars of the star in the star of the star in the star of the star in the star of the star of the star in the star of the pointed out by a line from # through & Urse Majoria,

carried as far again. The other stars of the group are identified by the fact that their apparent metions are also directed away from this point, though they are also directed away from this point, though they are widely scattered over the sky Two of them are nearly in line with the stars of the Dipper, though far removed on each side—\$\beta\$ Aurigas and a Corona. The former is the removant of the group, about 10 light years away, while the latter is abo

as those previously described

Parther southward, in quite a different direction,
is the star & Leonis, whose calculated distance of 39 light-years puts it much nearer than these others, and suggests that direct observations of its parallax and suggests that direct observations of its parallax would be desirable Finally, and most remarkable of all the splendid Birius is undoubtedly a member of the same group it owes the brightness to its rela-tive neuroness to us—only \$1/2 Light-pears according to the demands of theory which in this rame is con-firmed in a most satisfactory way by direct obserwe may fix our eyes first on the N tle Bear, to which this belongs, w the Bear, to which this belongs, while most conspicuous groups, is easily type a tolerably good "Dipper," though less phrase may be pardoned) than its in The figure of the Bear, as shown in chardiy be made out except that the life to the Dear water which water wat ing in Polaris makes quite an u Polaris itself, spart from its positions as a double star, observable with as a double star, observance warm while the spectroscope shows that it the two is attended by two invisits with a period of less than three da more remote, with one of several Around the Bear coils tha Pro-

Around the Bear coils the swar almost overhead, the Great Bust Bouth of this we find the Lion, with southern sky, tho ungainly leng pent, Hydra. Above this come the of the Crow and the Cup, and:

east

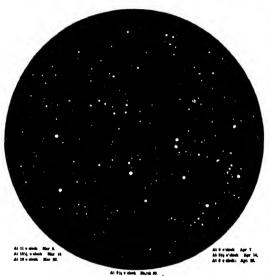
will not be plate table til the latter part of month, when he inte bour and a half at seen shortly aft At this time he Taurus, and on the he passes close Piciades, which he mrnames in brishi

Venus is a morning time, rising about 4 A M. on the 1st and 3 15 A. M. on the 30th She is extrinsi-

the auth the is extremely brilliant, and eathert possibly be mistaken Mars is evening star in Gemini, alewly moving castward among the spars and still losing in brightness as he recedes from us. He is very far agent all through the mouth, and

all through the month with a consequently guideline for consequently guideline for consequently guideline for the fight until assign to the second second for the state of the second for

disk, as anopome we use set, save, and a set of the set of the sevening lower is our part of the set of the sevening lower is our part of the set of the s



NICHT SKY: MARCH AND APRIL

When the actual brightness of the other stars of the system is computed it is seen that fiftrue is actually one of the fainter members of the system. Its total light is about thirty times that of the aux while that of the Pflacenia stars of the Dipper and of α Coronae averages fully twice as much, and that of a Aurigas is about ion times as meat. Delit Lonis, on the other hand, is only about ten times as brightness on the other hand, is only about ten times as brighen, as a bin suin, and the fainter stars near the Dipper, has the suin, and the fainter stars near the Dipper, because the suince the start of
bright. This system therefore consists of unusually bright. This system therefore consists of the great extent. It is remarkable also for the great extent is assoc Botteen the outer that of the group there must be hundreds of stars, of which over one in clock, which have no connection with it. It is as if a dosen some of the connection with it. It is as if a dosen some system of the connection of the same spect. Though the connection with a same spect. Though the connection with the connection with the connection of the connection with the connection of the connec

in the same direction and at the same speed. Thought many of the crowd intervent, the mare fact of this progress toward the same point seven to distinguish them, and is a mark of their common origin. It may be added in conclusions that a very large proportion of these stars, at least six out of the ten abon on the map, are either visually or specify-scapitally one. Turning now to the constallations, excitating the same proportion of the contraction of the contracti

NOVEL CHANGEABLE PHOTOGRAPHS

BY F. HONORE

"Prof. Lippmann recently described before the heademy of Sciences at Paris some novel changeable sistographs made according to a method devised by f. Batanave, secretary of the Faculty of Sciences of

feeping woman. By inclining the picture a few milli sters and rocking it elightly, the eyes apparently the like the eyes of a porcelain doll, with the exthe the eyes of a porcelain doil, with the experior, however, that the entire face livens up in
the extraordinary manner Incline the picture
that the system strength of the product of

me be used to obtain the effect because to the control of employing a special half tone acrean a creder to explain how M Estanave obtains his creder to explain how different photographs ma uruer to explain now at Examave obtains his gladars, let us consider two different photographe-ths one D representing a electing woman, the other is the same woman awake Each photographic posi-tive is ruled horizontally from top to bottom, so that both photographs appear finely banded if we reboth photographs appear finely banded if we re-move from the positive D even alternate pairs of bands, and from the positive E odd alternate pairs of bands, and if we place upon the positive D the bends taken from E and upon E the bands taken from D, we will obtain two new pictures which we may designate D' and B'. These new pictures D' and B' are composites of D and E. If the bands are narrow enough, 30 per centimeter for example, their

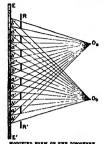


THE SLEEPING WOMAN

discontinuity will not be noticed. The composite uncountry will not be noticed the composite pictures will apparently be complete and comparable with the balf-tone pictures to be found in the Sauk-Tivic American or in any other modern illustrated periodical

Let us now combine the two composites D^1 and R^1 in other words, let us transpose strips of D^1 and

strips of E^* without disturbing their order. We obtain still another positive D^* , formed by the combination of the two preceding positives. When looked



MODIFIED FORM OF THE DISCOVERY.

at directly this new posttive P is rather confusing, hut when looked at through a glass plate ruled alter-nately with horizontal opaque and transparent bands of a width equal to those constituting the positive itself quits a different effect is obtained. If we hold itself quite a different effect to obtained. If we hold this glass screen in such a meaner that the opaque bands cover the bands of the positive h we will see only the bands of the positive h, and we will obtain the portrait of a sleeping woman On the other hand, if the screen be elightly shifted so that the bands of the positive h are covered we will have a portrait of a screen with a wake. Since the different effects of a woman wide awake. Since the different effects are obtained simply by shifting the screen, the single photographic view seen through it can be caused to thange its appearance very rapidly simply by changing like speed of the screen movements

ing his speed or the stream movements.

In actual practice the ruling of the positives and
the transposition of the bands, as well as the use
of a suitable screen, is attended with consider
shie difficulty. For that reason, M. Estnave has
devised a singler method which is illustrated in the

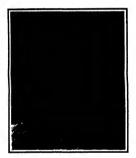
devised a simpler method which is illustrated in the arrompanying diagram.

Let a and b be two different objects the luminous says from which full upon a sensitive plate or a ground glass ES in the path of these rays at a sultable distance, the horisontal ruled acreen RR is placed in the diagram the spaces separating the lines of the screen are considerably exaggerated inter or the screen are community cangerate and the screen itself is shown in vertical sensitive plate will receive a series of images of a alternating with

In making the positive photograph according to this method, the subject is first placed at Oa and then at Ob At Oa the subject must appear asfeep, and at Ob wide awake A composite picture will be obtained on the sensitive plate If this picture be examined through a screen similar to that by means of which the picture was made, and the visual angle be varied either by shifting the eye or shifting the screen fu-portrait will apparently open and close its type

Theoretically several different pictures can thus be Theoretically several different pictures can thus be superimposed in actual practice M Estanavo has combined three which are clearly visible However there is a limit to the number of pictures that can thus be combined for the positives become more and more incomplete as the fillform bands composing them more incomplete as the niferral bands composing them are more and more elongated in the case of two aspects, the elements of an image are adjacent, the one to the other with three aspects, the consecutive elomonts of an image are acparated by two elements belonging respectively to each of the two other images, and so on

images, and so on in order to simplify the adjustment of the screen relatively to the composite image, and in fact to avoid adjustment entirely. Mexicane employs an improved auto-streeneepic plate which ho has in writed. This plate is rused with a screen on the side which is not consulted, the rulings being such that alteration expanse and temporared bands are pro-that alteration expanse and temporared bands are produced The new invention of M Estanave's is so con ceived that the plate serves a double purpo plete is mounted with the ruled surface in front, or plate is mounted with the ruled surface in front, or it can be so planed that the ruled surface is either horisontal or vertical. When the ruled surface is placed horizontally changeable photographs are ob-tained. With the ruling verifically placed images can



THE WARING WOMAN

be obtained directly visible to the eye with a store scopic effect. With two stereoscopic lenses mounted so as to obtain filiform images formed by the super position of the two images of the object taken under position of the two images of the open taken under the same aspect, the verifical lines of the screen se-lect for each eye the particular image of the stereo-scopic couple which are intended for it

At a very early period repeated efforts were made to replace mother-of-pearl, so expensive at times, by some substance possessing the same valuable proper-ties, but the results arrived at siways fell far short some substance possessing the same variantle properties, but the results arrived at large self far short of the espectations which were suterathed, and these demands are supported to the same problem, it being believed that the progress made in chemistry and applied science suffered grounds for hoping for more favorable results and, in fact, some of the initiations of mother-of-pauri now made seem to show that these expectations will not disappointed. It is true that hitherto but few detailed directions for making strikeds mother-of-tended the superior of the superior aluminium silver will never gain a footing as genuine dinies when, for instance, not even the well-in colluints mother-of-pearl can gain recognition

as an equivalent. The purpose to which artificial its efficiency as a substitute, and this degree of effici ency in its turn depends mainly on its external re hisnes to the natural product. For combs, ha s. hat pin heads, etc. celluloid mother-of pearl may be used with heads, etc. celluloid mother-of pearl may be used with-out hesitation as an initiation, for ornaments, on the other hand, such as fastaning plas, bucktes, etc., the preference will unturally be given to substance whose external resemblance to the penulian material is com-pleted or hearty as Special interest, therefore, at-taches to a new method of preparing artificial mother-density of the second of the second of the second of the contraction of the second of-pearl, which we proceed to describe in detail

The ascertained fact that collodion, mixed with car-

The accretained fact that colloides, mixed with can-be halphilds and a few parts of pear-feitive fluid, yielded a substance more or less resembling mother-opeart, led to a method of working directly with celluides solutions, and in this way the celluided a material which has been used for a variety of pur-poses in the industrial arts. As however, the in-imamability of celluided considerably restricted the employment of this new material, efforts were mot-tor replace celluided by another substance. This sub-tance was celluid. to replace celluloid by another substance. This sub-stance was cellife. The process of preparing artificial suction-d-pearl from this base is as follows: 100 parts of childs. Esselved in 38 to 30 parts of glacial accele

acid or chloroform are mixed with 20 parts of cal acid or chloroform are mixed with 20 parts of cal-cided magnesia and 4 to 8 parts of post cessence, with continual ettring. In this way a more or less visid mass is obtained which is allowed to dry in the air. If a few drops of carbon blashphido are added are it a new crops of caroon manipulous are anose to the fliquid solution a beautiful iridescent inster is imparted. As ceillit dissolves comparatively slowly, it is advisable to prepare the solution a day or two beforehand. In case of need, the process of dissolving beforehand in case of need, the process of descoving may be somewhat accelerated by sloc heating in a water-bath When dry the artificial motier-of peari present the appearance of polished mother-of peari plates that in addition it is distinguished by great ductility and shatelity. The treatment of this arti-ficial product is, therefore much assier than that of smulic mother-opear! It has also been attempted to substitute mother-of pearl dust for magnesia and very satisfactory results have been obtained in this very satisfactory results have been obtained in this way it is also possible by means of this proves to produce articles peris casely like real ones to this purpose the artificial product is propered in rather thick plate from which with a re-of and parts of any feeling size and form turned on the lather Those parts are superior in point of resemblance to the natural product to the fish or wax pearls hitherto made from glass and are not so brittle as the latter—Deutsche Goldschmiede Zeitung

NOTES ON OVERHAULING A BO

Square Hunging for Boats.-I think square bungs are a big improvement over round bungs. They do not waken the planking or chafing streaks and may more quickly be inserted

The chaffing strick on a round stern that has been bunged with round bunging invariably breaks sooner or inter where the round bungs have been inserted Where the square bung is used the naif is driven and



SQUARE BURGING

set. The square punch which is a trifle larger than set The square punch which is a trifle larger than the nail head, is then driven in making the aperture for the square buing This punch should be hardened and ground on an onery when making the corner just us keen and sharp as possible. Obbons rectangular bungs are perforable where the boat nail is used in planting set. The hums are quite easily made of/16 of an inch square with a small burs asset, thin the new table slightly to produce the laper on two

sides of the bung
Wheel Calker—The wheel calker illustrated here Wheel Calker—The wheel calker illustrated here-with will esselly fires cotten into solid wood where there is no seam or joint. The shape gives one con siderable leverage. The cotten is first placed along the seam by attaching it with the point of a kinife at short distances, just enough to keep it in line with



WHEEL CALKER.

It is now roady for the knife shape which calks it very rapidly Take a strip of iron %, by % inch thick, 2½ feet long and bend it to a flaring Ushape. The bottom of the U should be 4 inches as ross and to it the wheels are riveted. The iron strip ation it be drawn down a little on the ends to receive the handles. The wheels are 18 liches in tilameter. One of the wheels has a square edge 1/16 of an inch like. The other wheel is 3/16 of an inch like with the edge sharpened like a knife. There is a simpleg same plant of on the framework from a rest the square spired of decired death for receive the post to the desired death for receive the post type. Marking the Water Line on a Boat—Level the boat athwarmship, and decide where you would like your water line, which in the case of a knutch or small motor boat should be from two to three inches out edges 12 or 14 feet long placed lovel athwarming to the boat on a the bow and one at the size at the height of the water line decided upon Stretch a should be drawn down a little on the ends to receive



MARKING THE WATER LINE OF A BOAT.

cord across the simight edges with the weight at each one to keep it taut and let it tust touch the biles of the heat so that you may dot your water line along the heat. The proper way to make a true line is with a thin batting 3 or four inches wide and 10 or 12 feet iong with the upper edge pressed against the boat to correspond with the dots. Be particular to keep the batting exactly plumb edgeways and you can correctly

scratch in your water line.

Simple Method of Weighing a Roat.—Take a lever six or eight feet long, place a fulcrum on the ground

BY ALBERT F. BISHOP

near the bow Let the fulcrum (at 2 in the drawing) be just six inches from the end (1) of the lever that be just six inches from the end (1) of the lever tasks in under the bow of boat. A person that would weigh, say a hundred and fifty pounds, should work along on the lever, say to 3 or until the weight of his body would just lift the bow of the boat fear of the block ing With a piece of chalk make a mark on the tever at this point. Divide the distance from the fulcrum to the chalk mark into 6-inch spaces and add 150 bounds for each space. For instance, sight space



WRIGHTEG A BOAT WITH A LEVER.

would mean 1,100 pounds, which would be a little iese than half the welch of the boat, as the how out data half the welch of the boat, as the how out is manufactured in the same manner. The boat hoting baster at this end will call for more spaces. When this weight has boen determined add the two weights and the result will not be far out for the entire boat. The blockings the beat rest on while the boat is 10000 should be at the extreme and.

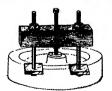
A Home-made Lifting Jack—The jack here illustrated is made with a srew an inch in diameter and eight or more in length and a good heavy and, the corners of which have been notched down with a file to receive a heavy washer. The jack they may the corners of which have been notched down with a file to receive a heavy washer. The jack to the wide to receive a heavy washer. The jack to the part of the nut which comes through the washer should come through far an 1,200 pounds, which would be a little less



A HOME-WADE LIPTING JACK.

ough to allow for good heavy riveting on the was This makes the base for the nut to rest on and it is then placed on a wooden block, which is well secured town piacet on a women most, where is were necessary with four wood server. The base of the jack is a heavy block placed with the grain running at right angles to the upper block which holds the nut. The cap and lever require no description. The brand base prevents the jack from settling in the certh and from capaizing as well, which is a good feature around boat

A Home-made Wheel Puller—A simple wheel puller can be made by taking a piece of maple about 3½ inches square and about sixteen in length and fitting it with the bulls about as shown in the accompanying sketch. The nut for the center screw has the wash



HOME-MADS WHERL PULLER.

attached to it in the same way as in the lifting jack and it is similarly attached to the maple. The wheel bolts carry two bread suck is calcide on the rear face of the wab or spokes of the wheel. The wheel is shown in dotted lines. That series is often recorded to in removing wheels from gaseline engines. This is—plement said the lifting lock have been in use four or five years. They have slood bots of wear spat appraisably are as alreage for ever. A province journally

on the wheel puller is obtained on the outside is with any suitable wrench. with any suitable wrench.

Convenient Flywheel for Gasolene English

all the flywheels for small marine gasolene on are filled up with spokes or webs with few hole them, which makes it very awkward to get at the centric strap and pump to tighten the nuts and , box. Nearly every time this is done the man in BOX. Nearly worth time this to describe the handmer. I have designed a whoel and used a single for four years. It has only two shand wind doing away with the orangle. angine for four years. It has only two and hand rim, doing away with the crashs which is a dangerous feature. The plate lythogo covers the key as well as the styles, tached with two machine screws.

This makes a very tidy looking wheel

intely safe because the



A CONVENIENT PLYWREN.

caught in the spokes. It is a great convenience in the stage behind the wheel or repletation, as it follows take a minute to remove the cores place of the stage


THEPROVED GASOLINE VEHICL.

and should always be smaller than the receiving hele in the gaseline tank. The supports for the tunnel are made out of garbanisade ires I inch wide east 4,78 thick, bending the upper end to conform to the angula 8,745-inch galvanisad wire hosp about tog inches in diameter. A critic larger than the upper part of the tunnel is good proportion. In a standard exists which can readily be procursed. The parts that are attended are well endforced. It is not necessary to river these. Place a virue sums about 6100 or existy means the second of the contract of t

Place a vire gauge about fifty or skry menh to the inch inside of the tunnel. It a champing fifty is de-sired make a band of metal that will easily skip inside of upper part of the tunnel. The lower end of this is covered with champing, which is hald in place with small twine. Task a strip of valuanised fifer to the measuring with measuring stick.

measuring stick. The graduations of gallous photals in marked a lamp black mixed with shelling. The velocities in turns a mark and presented intelligence when dispute graduate, within the present of the control of th

RECENTLY PATRICTED INVESTIGES.

of Interest to Paramera.

Office of States of

unicity packed for transportation.

COMBINED CAND AND CAMP STOOL.—

M KILAJAR, Elikton, Colo. This folding device can be easily curried about and will serve not only for a seat when natioled, but may serve as a writing stick or cane when folded. This main folding parts are so arranged that when folded they will fit together so as to when folded they will fit together so as considering the compact arrestrict without sacridoing makers.

ANTHONIUM BARS FOR DOTS.—P T BAILEY, Newport, E. L. The object of this in-vation is to give a time in the control of the street in the provides a base in which there are two sets of anthering soline which may be provided. The base has means for adjustably supporting a frace poor, whereby the post may provided by the base in the provided by a provided provided by the post may FLASTICLEUTY.—I. A. Witchell is not provided and for the provided in the provided by the post does a final-hight having inspired masses for leading and exploiting a certridge on final-down and provided and provided and provided and forther, to provide a centraling on provide and forther, to provide a centraling on for supporting and firing flash papers or dash shorts.

DERRICH DEPUTED DEVICED.—C. H. Prints, H. Hang, and S. C. Straighten and Mischanical Devices.

How the prints, H. Hang, and S. C. Straighten and Mischanical Devices.

How the prints, H. Hang, and S. C. Straighten and Mischanical Devices.

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adverse under the masse of A. O. Co. Standard Inquiry No. 8185. -Wanted, marrie loculty No. 9164, Wanted, addresses of ontirestaring sovelopes.

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femulty Ye. \$117 - Wested no Tanulty No. 21 IR. - Wanted, a maller by a page has reaches, built appe the principle of the Maxis should recently broader and for one or the Inquiry No. 91 18. - Watted, name and Josephy No. 81 98, Wanted, the a Inquiry No. 9191. Wanted manufacturer of on secola for favor work, sofa pillows, etc. and oil of-mal breaker for more. Fuguing No. 9180, Wanted, manufactus

inequiry Ko. \$193. Wested, names of ter y declars in crude getts person and rubber Inquiry No. 8194. - Wanted, mone and address of a current of a current in Germany making a machine to manufacture a cometo and substitute and building income Inquiry No. 9144. - Wanted turns and address of Inquiry Vo. 9196, - Wanted, to buy putting up and propering condensed milk. Jaquiry No. 9197. Wasted, pidross of L. Den

phase are combined to form only size modify. June 1; F. N., § 1 GB. "Watted, delensors of guadrance for paper box factories, or new hand paper box making machinary. In only with a pilot, whence parties to the a few was parties to bring a few machinal sized, for shot given. I may rey No. § 1 31, ... Wanted, information or where I could said a manne of the one, where I could said a manne of the one.

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Bulletin,

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GCencindes from page 250.)
see of the continuous movement of alls, the fiame cannot be brought to against any one point in the armor enough to meit it through

The Action of Radium Res.

Upon the Elements of the
Carbon Group.

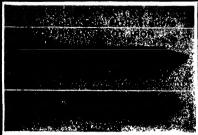
A lively sensation was created, two
sars ago, by the publication of Sir Wilyears ago, by the publication of Bir Wil-ilam Ramsay s experiments on the action of radium emanation upon copper According to Ramsay, the energy released by the emanation causes a disintegration of the atom of copper, and converts that metal into elements of smaller atomic weight, which are included in the copper group, in Mandeléed's classification. group, in Mendeleers classification. Remmay claimed to have found, among the products of the action of the emana-tion upon copper, minute quantities of potamium, sodium and lithium Madame potamium, sodium and lithium Madame Curle repeated Ramsay's experiments, but falled to obtain the same results, and pointed out certain possible causes of error in the method employed by the English physicist. Ramsay has since re-peated the experiments, taking care to peated the experiments, taking care to: climinate these possible sources of error, and has reached the anne results and conclusions as before. He has lately ex-tended bla researches to certain element of the carbon group (allion, itianium sircontum, thallium and lead), which, if the happolhesis correct, should be dis-aggregated by the netlem of the emana-ration and essentially into carbon.

group, and especially into carbon
The following method was employed
by Ramsay and his collaborator Usher From a solution of radium bromide con taining 211 milligrams (about 3 grains) of the metal radium the emanation pro-duced in the course of one week, together with the explosive mixture of hydrogen with the explosive mixture of hydrogen and averen which always accompanies it, was extracted by a pump The total quantity of gas thus obtained amounted to about 25 cubic centimeters, and con tained 0 0912 cubic centimeter of radium emanation, mixed with hydrogen, oxygen carbon diotide and other gases The hydrogen and oxygen were combined as replacion. Texture to the continued are replaced to the continued as a continued of the This was collected in a small glass tube conted with fused caustic potant, which absorbed the carbon dioxide in the course of an hour. The residual gase was then introduced into a giase finely continued to the continued of the continued as a contraction of the continued of the continued as a continued to the continued of the continued of the continued to the continued of the continued of the continued to the continued of the continued of the continued to the continued of the continued of the continued to the continued of the continued of the continued to the continued of the continued to the continued to the continued of the continued to the continu the solution which was to be subjected to the action of the emanation. The con-tents of the flask were left undisturbed for four weeks at the end of which period the activity of radium emanation completely exhausted. The gas was sen drawn off and analyzed. It was found to contain carbon dioxide

It was found to contain carbon dioxide invariably and carbon monoxide in some cases. The following table shows the quantities of carbon thus produced from various solutions by one cubic millimeter of radium emanation

Bolation of
Hydrogen silicon fluoride H₂SiF₄ 0 518
Titanium suiphate Ti(8O₁)₄ 0 982
Zirconium nitrate Zr(NO₁)₄ Thallalum nitrate Th(NO₁), Lond oblorate Pb(ClO₂), 0 102

Ramesy and Usher conclude that carbon is produced, in greater or smaller quantity, from all the other elements of quantity, from all the other elements of the carbon group by the action of radium emanation. The elements of high atomic weight, with the acception of lead, which seems to be particularly stable, appear to be disaggregated more easily than the elements of low atomic weight. Experi-ments on elements of other groups are in progress, but those described above ap-pear to prove seprond question that the atoms of the chamist can be broken up by the action of radium examption. by the action of radium Revue des Sciencis!



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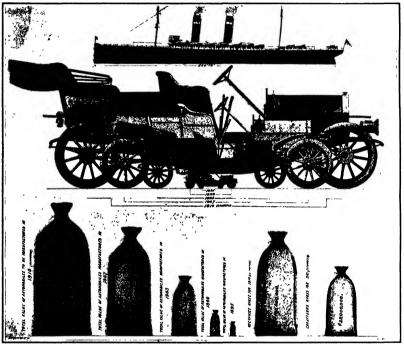




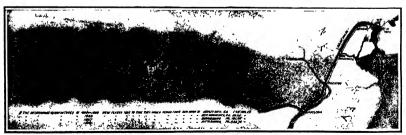


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SCIENTIFIC AMERICAN ESTABLISHED 1845

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NEW YORK, SATURDAY APRIL 9th, 1910

The Riller is always chal to receive for examination dissertated at on subjects of their winterest. If the phote graphs are sharp, the a phote and the his auctionite the contributions will receive a alcount in Accepted articles will be paid for at regular space rates

LIEUT ERACKLETON

LIEUT SEACELLETON
OWEVER thrilling the average man may find
Liut Shackletons modest and self-effacing
recital of the Antaretic hardships and tri uphs of his brilliant expedition it is to the scientist that the English explorers character must assuredly appeal most strongly No doubt the dare devil courage of the Englishman, whose love of adven ture has sarried him into the heart of Africa, the wilds of Australia, and the mysteries of Thibet enters largely late Shackletons nature. How else could be have endowed the numbing cold and the paness of put vation? But the sacrifices made during that famous expedition which brought him within actual sight of the Soulk Pole are essentially scientific in characterwhich brought him within actual sight of comparable with the horoism of the man who exposes bimself in the stings of diseasu-carrying insects, that mankind may know how best to protect itself against the ravages of yellow fover and the shoping alchness His modesty of demennor and speech his generous praise of those who accompanded him, his liberality in donating unineralogical and ornitiological collections our muscums collections made when the desire was strong to shandon them in the hour of weakness and hunger) and above all that unwillinguess of his to appear as rival to Capt Scott his former chief, which has jed him to postpone his own Antaretic plans so that Stott may have no difficulty in obtaining funds. are all characteristic of the unscillab selection in whom the sense of personal importance is overwhelmed by the high ideals of the cause in whose furthcrance he is

Scientific too in its purpose is the expedition that Shackiton has postponed in deference to Stott, for that expedition will be undertaken not primarily to reach the Pole but to fathom the many mysteries of the unknown land fronting on the South Indian Ocean, the unknown land fronting on the Solita Indian Ocean, and presenting many scientific and geographic problems for solution By swatematically exploring the coast around King William Land a coast which has never been carefully studied from shipboard because of float ing ice ice will probably determine once and for all whether there is any reason for questioning the claims under h) Adaltral Wilkes to the first discovery of the Antartic Continent Shackleton a sure of fair play. The sense of whenlife justice in other words, end nently fits him for this peculiarly deltate task. The insert reception which Shackleton has accorded Parry for the discovery of the North Pole com

corded trary for the discovery of the North Pole com-ling as it does from a man who knows something of the rigors of polar exploration ought to shame the Con-gress which refused national honor to Peary without proof of the North Poles discovery. The doubt which proof of the North Poles discovery. The doubt which has been foolishly cast on Pargy exploit by a congression whose "furthest north" as one Washington correspondent phrased it is the semi-tropical cold of Omaha. Nob. is more than extinguished by the cordial deformer with Sinch-Polon linas shown toward Pars, on the occasion of their many public meetings.

A PLEA FOR CO-OPERATION,

IT silk development of rapid transit in New York (the has reas led a critical sizes, for upon the events of the next few months will depend to the upon the develop whether a certain proportion of future mishway travel is to be paid for at the present rate of five container they not double that amount Now, it is generally agreed that one of the indispensable conditions of the future development of the pensable conditions of the fullire development of the subway system in this city is that the fare shall at no time exceed five cents, for which sum a passenger must be at liberty to travel from any one part of the system to any other. The universal tendency to-day is toward the cheapening of transportation, and the

possibility of an increase from five cents to ten cents per trip is not to be considered for a moment,

Nevertheless, the people of this city are to-day com-onted with the possibility, if not the probability, of remned with the possibility, if not the probability, of just such an increase of fare, and this condition is due in large measure to the strained relations between the Public Service Commission, whose duty it is to the Public Service Commission, whose duty it is to safeguard the fransportation interests of the public, and the Interborough Company which has a practical monopoly of local fransportation. The Public Service Commission with shortly call for bila for the construction of an additional subway extending from the Bronz to the Battery, which will be absolutely independent of In the lattory, which will be absolutely independent of the route which is now in operation. The new line as laid out would be an excellent one, were it not for the grave direct that nowhere does it make connection with the cristing subway. This defect however, must be made good by providing for each connections as will enable a passenger to travel for one fare from any point on the one to any point on the orter system.

any point on the one to any point on the other system if we look at a map of the present sulway ronte, it is evident at a glance that an extension of the existing lines north from Porty secund Street through Lexing-ion Avenue to the Bronx and an extension of the Broadway line from Times Square down Seventh Avee to the Battery, would provide the city with independent north and south routes. The Public Service Commission long ago recognized that this was the next logical addition to make to the present facilities. and they hoped that the interborough Company would make a proposal for future extensions of their system make a proposal for future excansions or inter systems over these routes. Unfortunately, the company, in effecting to build these lines, has obstituately saddled its proposal with a demand that it be allowed to build a third track on one of the elevated rallways of

Now the city, as the Interborough Compa well knows has established for all time the principle next nows has established for all time the principle list, since the existing elevated structures are a de facement of the streets in which they stand not only shall no further extensions be made but as soon as other facilities are provided, the existing structures shall be removed. Therefore, the Public Service (complusages at one and commission at once and very properly refused to ac-tede to the interborough proposal, and, estensibly, it is upon this question of extending the elevated service the Commission and the company are at variance that the Commission and the company are at variance Falling lo get any satisfactory proposal from the interborough Company, the Commission bave tail out an independent route which extends from Woodlawn and Pelham Bay Park in the Bronx to the Hariem and Pelham Bay Park in the Bronz to the Harriem River, and down Lexington Accuse and Broadway to the Hattery Bids will shortly be asked and as we have noted above unless the interborough should put in a bid agreeable to the conditions laid down by the Commission, the new line will be huilt independently of the existing andway Thereafter, if anyone should Commission, the new line will be built independently of the existing aulway. Thereafter, if anyone should have occasion to make a trip involving a trausfer from one system to the other he will be able to do so only by the payment of an additional fare—a condition which for a large proportion of the traveling public would amount to a nositive hardship

Now the contingency of having to pay a double fare is so serious that it demands immediate and careful as so serious that it demands immediate and treat-consideration We believe that the exercise of a more illustal policy by the Interborough Company and the exhibition by the Public Service Commission of a fit lie more confidence in the attitude and purposes of the Interborough people would result in a compromise of lasting bettefit both to the corporation and the travel ing public. The interporough Company certainly owen ing public. The interborough Company certainty owes mush to the city, and we say this with full remem-brance of the fact that Mr Belmont, at a time when capital was looking askance upon the subway proposi-tion, came forward courageously and provided the tion, came forward courageously and provided the commons capital necessary for construction like has reviewd in the past and always will receive credit for the good service which he rendered to the city in a very critical emergency. But having admitted this much, we cannot lose sight of the fact that avenue has a proved first, that the ambuny property is soon-mously predishelm and second that the turns govern-mously predishelm and second that the turns governing the relationship between the operating company and the city are very liberal indeed if Mr Belmont conferred a great benefit upon the city, the city has repaid him tenfold by providing the subway line with traffic far greater than was anticipated when the

Now the Interborough, with its magnificently equipped system, its thoroughly trained personnel, its strong financial standing and its rich accumulation of operating experience, is obviously the interest best with and operate the new line, making it. equipped to build and operate the new line, making it equipped to build and operate the new like, making it an interral part of the present system. Provided it will give reasonable guarantees, the city would just as soon, and perhaps rather have the Interborough people build and operata the new aystem than any obser custed interest Unfortunatily, the attitude of the company toward the city in the past, as shown in its aimnost contemptuous treatment of the Public Service Commission, has had the Inavitable selbed of years of dutters, it found to hostility, against the property of the past of the property of the company on the part of the public. This tunate, unnecessary, and, to those of us what stand what a really magnificant service. February is at the company is at ing, it is to a certain extent unjust.

Arms on

The present inacture affords a great opportunity to the Interborough Company If it will only waite its never-to-be-granted demand for further elevated restnever-be-erraited demand for Inches elevated with vary facilities, the city will meet the company far a liberal spirit. Should the company put in a Mad for he were like the selection of the present coagestion on their own lines, they will more at once the problem of the present coagestion on their own lines, they will more at one the problem of the extent of their aiready encouncy profitables 5602 of operations, and they will place themselves cross one as last of animals resistantially with the second of the present coagestion of their coarse of the present coagestion with the control of their aiready encouncy profitables 5602 of operations, and they will place themselves the coarse of the present the prese

A REPORM IN METEOROLOGICAL SHIPS.

N common with the other sciences, metaorolog burdened with a dual system of units. G Britain and America continue, in a majority of their mateorological publications, to record rain fall and atmospheric pressure in inches, wind velocity In miles per bour, and temperature in Fahrenbeit de grees, while all the other nations have long since grees, while all the other nations have long sizes adopted millimeters, meters per second, and Omit-grade degrees for the same respective measurements. There have of course been many projects of reform, but only very lately has uniformity actualty been attained in any branch of the science
The United States Weather Bureau and the British Motorwolgist office have admitted years of the most of the science.

Motorological Office have definitely adopted the metric system and the degrees of the Centigrade temperature scale for recording the results of the observations made with kites and bailoons—the former at its research observatory at Mount Weather, Va., and the latter at several "aerological" stations now in operation in the British iales

The British have gone a step further The text tures met with in the upper air are very frequ tures met with in the upper air are very frequently below the freeing point, so that the shallated observa-tions expressed in the Centigrade scale, abound in megality values, which are awkward to deal with and also a fruitful source of errors in computation. The absolute scale, counting in Centigrade degrees from the absolute scare (-271 dog C) has no negative values, and the use of this scale is now common in the values, and he use or this scale is now common in Lies discussion of many physical problems with which upperair research is closely concerned. For these reasons the Meteorological Office has begun using the absolute scale (also called the Kelvin scale) instead of the ordinary Centigrade scale in all records of tem perature obtained by means of kites and balloons. no less radical reform has been introduced in the pub ilcation of barometric pressure, in the same class of British observations The unit adopted is a C G S. unit of force, viz., the megadyne per square contimeter, in place of the familiar units-inches or millimeters in piace of the familiar inits—inches of millimeters— expressing the height of the mercurial column. As a matter of fact, the "mercurial column" is a pure flo-tion, so far as the observations in the upper air are concerned, the barometers attached to tha kites and concerned, the barometers attached to the kites and balloons always being ameroids, and it is much less important to know the height of this imaginary col-umn at any level than to know the fraction of the at-mosphere that lies above or below the level. This fraction is directly indicated when the C G S unit is employed, since 1 megadyne per square centimeter is practically equivalent to a barometer reading of 750 practically equivalent to a barometer reading of 750 millimeters, in latitude 45 deg., which is the average pressure of the air at 106 meters above sea level in the same isilitude. Hence, if we assume 106 meters above sea level as the plane of reference in barometry tand there are sound reasons for preferring it to sea level, the plane heretofore in use), the C G S unit may be considered a "C G S atmosphere," and the may be considered a "C G B atmosphere," and the fraction of a megatyne per square restituenter recorded at any latitude gives, for all practical purposes, the fraction of the atmosphere that live above the point of observation. This until has been named the ser-and its use in all meteorological observations has been recommended by several writers during the past year. Lastly, the Meteorological Glock is now, in its litte and helloon work recording the direction of the wind

in degrees of a circle, counting from true north. East is 90 deg., south 180 deg. west 270 deg., and north 260

It is proposed to establish a wireless telegra-tion at the meteorological observatory on Mount tion at the meteorological observatory on Mount Mira-dor in the Philippines, to give warning of typhoons to vessels in the China Sea and points along the China coast. A similar station will probably be established later at Santo Dominge de Basco on the Island of Batan, for communicating information of the pres-ance of typhocos in that vicinity to the besiquarbers of the Philippine Westher Eureau et Mantin.



Augus d 1910.

ENGINEERING.

ENGINEERING.

The mode dead of canal encount on a Panama disnay Sericary was \$460,866 cubbe yards, of which InTrade 50the yards was dry encantion, done pinrated by team thereis. The amount taken out by the
Trade 50the yeards was dry encount taken out by the
Trade 50the piece eccepancy of the canal was about
Tablessed cubbe yards. Under American occapations
Tablessed cubbe yards. Under American occapations
Tablessed 10th, 10 Pebruary 18th, 1110, over 100toms hay 4th, 19th, 10 Pebruary 18th, 1110, over 100-090,000 cubic yards have been removed, leaving 74,49

B. is inevitable that the New York Contrait Rulti-read's high accession for the new ration yard to treat high accession for the new ration yard to be streamed to the surface of the is formed in the fact that contract have been single for the construction of two large buildings, such or which will cover an entire city block, the new struc-tures to face on Learnington Avenus, and to be sup-ported on the lower store (contrain of the depressed period on the lower store) contrains of the depressed by the contraining the contraining the contraining the Marchante' and Manufacturer' Exchange, will contain a woman access rate of floor guarantee. R is inevitable that the New York Central Rail-O square feet of floor space

The contribution of Australia and New Zealand to the British Imperial Navy will consist, in each case, of a cruis r-battleship of the same type, but large than, the "Infloxible," which was present at New York during the Hudson Fulton Celebration, together with three 5-000-ton, 26-knot scout-cruisers, six torpedo oyers and several submarines. Each cruiser-battisship will cost about \$9,000,000, and each fleet unit shout \$20,000,000 They will form an integral part of the British Navy, and will be subject to the regular

The Committee on Electrification of the New York Railroad Ciub, after a years study of the subject, re-ports that no general information is available on the hasis of which steam railroads as a whole would be justified in electrifying terminals or main lines solely on the ground of economy They consider that more attention should be given to the possibility of slectri Scation in connection with heavy grades, and that it is necessary to proceed with caution in attempting the electrification of large freight terminals, which necessarily involve the traffic of a number of different

The Committee on Wood Preservation, in a report delivered at the annual meeting of the American Rail way Engineering and Maintenanco-of Way Association, states that the average results of tests of Dougles fit indicate a decrease of the modulus of elasticity of from 10 to 15 per cent for crossoted timber, as compared with untreated timber, and a decrease of about 30 per cent in the onter stress at elastic limit and at failur. Creosoting appears to have little effect on Douglas fi treaseling appears to have into ducet on Jougna sir in tonsion or end compression, but it does weaken it from 20 to 25 per cent in shear. Tests with other tim-bers show, as a ruis, corresponding decreases in strength as the result of crossoting

In protesting against the granting of any further vauit rights under sidewalks to owners of buildings along the principal streets of the city, the Public Seralong the principal stream of the city, the Tubile Ser-vice Commission has drawn attention to a most im-portant subject. Buch encreachments interfere grately with he laying out of new subways, particu-larly beneath the narrower thoroughtarss which are cound in the heavy portions of the city. The commis-sion states that in Maniattan the practice of spread-ing roundations beyond the buffling line has strong in roundations beyond the buffling line has strong heart than the commission of the commission of the heart taken, mat that if the city enforced distinguished. rights, the foundation s of some of the large ! would be afferted

B is gratifying to sears that the latest battleships of the United States Navy are not only living up to their contract speeds, but in recent choir trials ander full power at forced arount have very exceeded the original contract performance. The latest textance of this is the case of the "Louisiana," which, according to a dispatch to the Navy Department from Rear Admiral Schroeder, recently on a 4-hour full power trial maintained an average speed of 18,942 knots, and this in spite of the fact that she drew about 16 inches more water with about 1,000 tons greater displacement than on her contract run. The "Michigan" also made 19 42 knots, which is about a knot above her contract speed.

knots, which is about a knot ablove her contract speed. The resease frightful accident near Green Mountain, lows, in which forty-seven lives were lost through the cleaneoping of two wooden relaying cars, again draws attention to the denager that lurks in wooden constrout when the sease are as subject to the creating and telescoping effect of a collision. The heavy train of thirteen conches was drawn by two loomostrees which were running insider first. The formost tender gramped the tracel in a relayer occur, and the sequing swinging around, beautiful first. The formost tender supposed to the tracel in a relayer of the depth of the way to be a sequence of the contract of the tracel beautiful to be supposed in ablowing measuration of the tracel believe to the course of the contract which we have been contracted to the course of the

ELECTRICAL.

An electric elevator has been installed in the stair-way which leads to the enpoin of St. Peters Church in Rome. The elevator has a capacity for carrying to pursons. It bears an appropriate Latin inscription

parsons. It sears an appropriate Latin inscription.

A new combined electric and steam cooking range
has recently been patented which is particularly
adapted for use in hotels. The range is divided into
two compartments one of which is heated by steam, while the other is electrically heated. The latter is used for cooking, while the steam is used for heating the ovens it is claimed that in this way a steady supply of heat is obtained very economically

supply of heet is obtained very economically Feel Recollege, Rapid Transit Company Con-cept of Transit Company Con-cept of Transit Company Con-cept Company Con-cept Company Company Con-traction of the Con-cept Company Company Con-traction Company
The Berlin polleo department is provided with an extensive typewriting telegraph system. There are about 300 receiving stations throughout the city and suburbs. The sending instrument is provided with a keyboard, and when the keys are depressed they cause the message to be printed simultaneously at the send the message to be printed simulfameously at the send ing station and at the receiving station. The oblice of this system is to do away with the confusion of the Morse code. If the Morse tode were used, it would have to be transcribed before a message could be put in the hands of the officer to whom it was sent.

in the named of me officer to whom it was seent.

A series of experiments was recently made at Johns Hopkins University to determine the delectric strength of air it was found that the point at which a brush discharge occurred is only silghtly affected by the modesture in the air Frend for air to saturated air there is a drop in voltage of the discharge of less than the contract of the contract than 2 per cent. per cent. An increase of temperature ing of voltage by about 3 per cent. Very enriously it was found that the size of the conductor materially affected the ionisation of the air

"An investigation into the conductivity of electric insulators was recently discussed in the Physikalische Zeitschrift. It was found that hard ruiber is greatly affected by light, particularly ultraviolet mys and that gutta percha is similarly affected though not to the same degree. Chemical action appears to take place on the surface of the insulator, which protake place on the surface of the insulator, which privates a conductive coating Seeling wax and paraffine are also affected to a degree by light, but they are more subject to breakdown because of moisture The conductivity of wood is to a far greater degree in creased by moisture Glasse makes a very circuit insulator the same rod of glass may have parts that differ materially in conductivity. The investigation also brought out the fact that the insulating qualities of all insulators decrease with an increase in tem The investigation

About a month ago one of the Edison storago battery cars was piaced on the Twenty-elighth Street crosstown line as an operations of a car has been in constant operation since and has required no alterations or repairs other than are common to the ordinary street car it has proved remarkably conomical in the consumption of power Instead of costing two couls a mile as was at first stated, the actual cost of the a mile as was at first stated, the actual cost of the car has been less than half a cont-043 cent to be exact. It costs more to start and stop the car than to keep it running, and it was supposed by practical atreet railroad men that when the car was put into active service on congested streets, the cost of running it would far exceed the estimate made by the huilders Bo satisfactory have the experiments with this car proved, that an order has bee Company for sixteen more to eighth Street crosstown line been placed with the Edison a to be used on the Twenty-

▲ decidedly novel wireless tele a occaseacy nove wireless telegraph detector has recently bon invented by Prot Rosal of Turin It depends upon the torsional vibration of a fine iron vire, which is acted upon by magnetic lines of force that have a spiral direction. The wire is strotched me mirror which renerts a near of light on a screen. The vibration causes the light to spread out into a line whose length depends upon the amplitude of the vibration. When connected with an antenna, the oscillatory currents set up therein cause variations of the wibration. the vibratory movement of the wire. The wire has a matural period of torsional vibrations, and this being known it is possible to attune the instruments at the transmitting station to produce a maximum effect

SCIENCE

Mr. Henry Wilde, FRS of Aldericy Edge, is providing Oxford University with funds for the institu-tion of an annual lecture as a memorial of Halley

A monument to Horace Wells was unveiled on March 7th in the Place des Eints Unis Paris Wells was born in Hartford Conn. In 1815 and was a pioneer in the use of ultrous oxide gas in dental operations. He committed suicide in New York in 1848

We have read somewhere that Peter the Great, when he was staying in England, had a particular liking for the companionship of Hailey, and that after canning with him at Deptford one evening he wheeled islin in a barrow through a yew hedge and did such damage that its had to pay handsome compensation to John Evelyn the owner which incident shows that Shakes care was right in thinking that not every astr plucks his judgments from the stars

pucks in judgments from the stars Gold is usually classed among the metals which are soluble only in squa regia, i e a mixture of nitric and hydrochloric acids it has been observed however, that hydrochloric acid atome is able to dissolve old, in the presence of certain organic compounds which are here arranged in order of activity alcohol, amyl sicohol chloroform ethyl sicohol, chloral hydrate, phenol (carbolic acid) cane augar giverine triozymethylene, formaldehyde The solution takes trioxymethylene, formaldehyde The solution takes place slowly in the cold, but is accelerated by heating

The Meteorological Office at London and the Deutsche Seewarte at Hamburg enried on jointly in February March, and April of last year and again in August and Sentember, an elaborate investigation with regard to the use of whices weather reports from vessels is weather foremating. The co-operation of the princi pai Brilish and German transatianik steamahip lines was secured, and each of their steamers sent reports was accurred, and an order steamers seat reports to kee daily while they were within a prescribed some of the occan. The net result of these experiments was that a majority of the reports arrived ton into to be of any service to the forecaster. It appears untikely was that a importly of the forecaster. It appears unitled that the meteorological institutes will feel on ourse that the meteorological institutes will feel en oursigned to take any further steps in this direction until the delay in transmitting messages from ships to shore stations is much reduced. The Secwario has announced that of the messages received promptly enough to be utilized by the forecaster during Angust and September, none led to any medification of the forecast as based up reports from land stations, but it is admitted that this might not have been the case with a differ-disposition of the weather conditions over the ocean

The Austrian State sale of radium has been en trusted to the Bergwerks-produktenverschiless Direk Minister for Public Works The radium is said in the form of radium barium chloride of three diff grades the price for each milligramme of radium chloride, including the containing cell, being 400 kronon it is packed in cylindrical cells of 21 milli stoned it is parked in symmetrical colls or 21 mills meters dismiter and 9 millimeters long, formed of nickel plated brans. On the bottom of the cell a layer of lead is case, in which is a square depression for the reception of the radium burlum chloride. The cell is closed by a mica plate held in position by the screwed on upper part of the ensing. On the bottom of the casing is an official stome (an eagle) and the series numing is no olikial stamp (no eagle) and the series num-ber findium cells senied with kad and stamped on the soldered part, are also supplied. The cells are packed in cotton and sheet it ad in a small box, together with a certifical bearing the number of the cell and the weight and radium-content of the prepara The boxes are scaled with strips bearing the numbers of the cells, and are despatched by por registered packets at the cost and risk of mir have

Howard of Inchty different systems of storm signals are at present used by the maritime countries of the world. A uniform international code is a deratom, and the task of devising one use intrusted by the international Meteorological Committee to a small commission which met in Loudon last ammuer and agreed to recommend to the committee the adopand agreed to recommend to the committee the adop-tion of a code proposed by fraf Morre chief of the United States Westler Bureau. This code substi-tutes a few simple combinations of the large conical symbols now used at a majority of the Europeau parts symmon now never at an angury or me annoyan pro-for the storm flags herefore used in the United States and some other consistes. Combinations of red and white funterns are to be used at night to convey the same information as the day signals. The proposed code has not yet however been formally adopted by any government, peuding the decision of adopted by any government, pending the dec meets in Berlin next September Since the London meeting objections have been raised by the German anthorities to the proposed night signals on the ground that they are not sufficiently distinctive and might be confused with other harbor lights. The Deutsche Seewarts at Hamburg is now experimenting with several systems of night signals and will lay the results of its investigations before the committee

TIMING AN AUTOMOBILE RA

AN AUTOMATIC INSTRUMENT THAT TAKES THE PLACE OF A STOPWATCH

Even the casual reader has no doubt observed that automobile records are now expressed in hundredths of a second, whoreas but a few months ago it was impossible to obtain any greater precision than fifths of a second, sit of which indicates that the use of the

time honored spill-second stop-watch been outgrown in automobile races one stops to think about it it is really absurd to try to time an automob ing anywhere from a mile to two miles and over per minute with an indicator that crawls at a smil's pace around a dial but an inch and a quarter in diameter. In the recent race at Ormond, for Instance where the mile record was reduced to 27.33 seconds by liarney Oldfield he was traveling nearly 200 feet each second, which is equiva-iont to the length of an ordinary New York city block When automobiles were first used for racing purposes, they were timed by hand with stop watches. But, wherever nte operator is depended upon to snap a stop watch, inaccuracies are apt to cre

in due to the fact that one person is quicker of perception than another. The timer must see the start of the received and as soon as this impression is received must start his watch, then at the close of the race the same operation must be undergone to also the watch. The little required for this mental and physical operation varies in different persons, and is known as the personal element. Not only does it vary with different persons but with the same person at differ entiles and interest persons but win the same person at duser entillines depending upon his mental and physical condition. For this reason, even in the timing of foot races it was long agn found necessary to have three timers and to take the time of the middle watch, for the instruments of the three timers varied as much as investifith of a second Early in the history of automobile racing an effort

de to climinate the personal element by hav ing stop watches snapped automatically by the cars thenselves making or breaking an electrical contact when they crossed the starting and finishing tapos itut, as we have just pointed out, even with the por sonal element climinated, stop-watches are entirely too slow to record the time of so rapidly moving an object as a racing automobile. The experiment of using a chronograph was tried in several of the races last year but as this did not prove very satisfactory, Mr C H Warner of the Warner Instrument Com Mr C H Warner of the warner instrument com-pany determined to make a special instrument par-licularly adapted for this purpose. This instrument van first used at Atlanta last December, and has just been employed for timing the Ormond and Daytona reces I works with the utmost precision, is en-tirely automatic, and makes a printed record of the race, reading to hundredths of a second. The neces-sity of such great reducement of timing will be appre-ciated when one considers that the "Lightning Bens" during its record mile run was traveling at the rate of 2118 inches at every bundredth of a second

Warner's instrument consists of four type wicels, one of which indicates boars the next min ntes the third seconds, and the last on of a second. The wheels are operated after the man-ner of an odometer instrument.

Over the wheels runs a strp of pa par and above that a typewriter ribbon, and a record is made by a hammer actuated by an electro-magnet, which strikes the ribbon and paper against the type wheels. In the circuit of the magnet which operates the hammer is a relay switch controlled by an electro-magnet in a circuit that is normally closed This closed circuit is connected with the starting and finish inpre, or with inpres at other points where if is desirable to record the The tape consists of a wire sirciched across the course at a height of a few inches above the ground and this wire is connected, to a switch ingeniously constructed to be opened by the shock, rather

than an increase of tension when the wire is struck by the wheels of an automobile. When the switch opens the instrument prints a record The type wheels are frictionally ment prints a record The type wheels are frictionally mounted on a driving shaft, which is rotated by an electric motor. At the start of the race they are held stationary, and are not released until the starting wire is depressed, when they wint zero and thay begin their revolutions. The hundredths wheel makes a revolution every two seconds. Obviously, the most important part of the instru-ment is the regulation of the electric motor which drives the type wheels it is impossible to construct a motor so perfect or a storage battery that will dis-charge so uniformly, that there will be not the elight



An instrument that times recen to handredthe of a see

est variation in the rotation of the driving shaft. cat variation in the rotation or the driving shart. However, the instrument is so arranged that at the end of every second its speed is automatically checked up with an accurate chromometer. At one end of the driving shart is a doublearmed lever, and in the path



Switching in the instrument as a car is approaching the tape.

of this arm is a small catch connected with the arma-ure of an electro-magnet. The chronometer acts ture of an electro-magnet. through a relay circuit to energize this magnet every second, thus moving the catch out of the neth of each arm of the lever



Marney Okticle approaching the finish line at the end of his record mile run. TIMING AN AUTOMOBILE RACE.

to turn the shart ever so slightly finiter than one turn in two seconds, so that each arm airries the catch just an instant before, it evithdraws. Secured to the base of the instrument at one life is a little "dillate" indictor, forming the armature of an elec-tromagnet. The circuit of the magnet is closed when ever the arm and catch contact, thus giring the "talla slight throb every second.

of the instrument watches this "telltale," will hand on the governor of the electric meter, and it is relitate" indicator lingurs too long at each statement of the arm and catch he slows up the motor a training

of the arm and eatch he slows up the motor a trisk; whereas if the "telltake" fails to register a common to speeds up the motor sightly, so ghest the arm will strike the eatch just belong are at the moment that the eatch is withdraws by

the moment that the eatch is weightferen by the chromenter. In this way a sawy seem-rate check is kept on the timing-of the may not come to the product of a second of the speed of the chromenter of a cord of a second of the speed of the chromenter of the chromenter of the cord of a second of the speed of the chromenter of a cord of the chromenter of the cord of the chromenter of the cord of the chromenter before an automobile is about to spench titled. An assistant gives a signal to the oppositor of the instrument at the proper time, and be thrown in a switch just in time to outoft the record of the automobile. At the same

the record of the automobile. At the small count in the hassistant calls out the number of the automobils, which the operator outre on the paper strp atongside of the registered time. When the car reaches a distant wire, the fact is commutated to the operator's assistant by tlassistant in will be observed that no personal element whitever the control of the time made by the smalless, the control of the time made by the smalless, the control of the time made by the smalless, the control of the time made by the smalless, the control of the speed of the motor and the easier and the control of the speed of the motor and the control of the sate of the ing of the automobile numbers opposite the they have made

they have made One of our photographs shows Barney Oldfield in his "Lightning Benz" just as he is approaching the finish line The other photograph shows Mr Warner in the timing stand about to take the record of the

To Homodel the House of Representa

Because the acoustics of the House of Rapressitatives, the second of the House of Rapressitatives are so had that it is aiment impossible for the Speaker to hear a member of the House, unless that member has lungs of leather, plans have been drawn and all preparations made for a transformation of the lower house of Communication. e of Congress.

lower house of Congress.

For many years now there has been trouble in the House both in the way of acoustics and with ventilation. For such a large body, these two principal features have not been as they should be. The plans in contemplation will remedy these defects, and make the

One of the main ideas to be put into executi the reducing in also of the chamber in this way it is thought that with smaller quarters, doing away with some of the galleries, and by narrowing the chamber, the accounties will be all that could be desired. The ventilation will also be arranged to better

mplated also bring the Ho The plans as contemplated also oring the House or Representatives in the same fashion as the British House of Commons. In this manner benches and small shelves will take the place of the desks and easy chairs now used by the members. The benches will resemble in appearance the chairs used in the-

aters. By taking away the deska and easy chairs, it is thought that those members not interested in the debates or speeches will absent themselves from the cham

themselves from the chamber
The Scor of the present chamber has an area of nearly 8,000
square feet. The Scor plan of the
proposed hall will only be shout
8,000 square feet. The scating capacity of the new hall will be 430, pacity of the new hall will be 430, although there are now less than 400 members of the House. Bosse of the lobbles and extra

Bons of the lobbies and extra-rooms will be cut out, and the ro-duction in size of the hall will, of course, result in the reduction of the public galleries, whose seating

d allo run.

Owing to the possible conditions of the hall, with regard to the hall, with regard to the constants and ventilation, many members while away their time by convening with each other in host touce or add to the constains by siamming their death or thicking the emploides, his portnenia are being made now for a noiseasing required or with the control of the constant on the thicked around.

Occaprate has airrady appropriated over half a juffice to didner for the trappolycomities, and the westlenes or withing for the obligations of the Santon constants.

A FINE LONG-SPAN MASONRY ARCH BRIDGE

BY OUR ENGLISH CORRESPONDENT

There has been erected on the new Bellegards-Chistery shootric rathway in France a masonery bridge which in span and height rathe as the largest of its type in the country, and which possesses many interesting features. The bridge is attented in the De partment de l'Alta, and is in close prox.

imity to the frontier of Switzerland in the canton of Geneva This imposing structure was designed and erected un der the supervision of Monsieur Picard der the supervision of Monsieur Picard engineer in chief of the Bridge De partment to whose courtesy we are in debted for the accompanying illustra-tions and details, and Monsieur Dor-road surveyor in chief of the depart

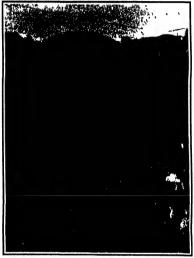
The new railroad passes through the wildest and most picturesque spots of the Jura Mountains and in its location the Jura Mountains and in its location follows the course of the Vaiserine stream a tributary to the Rhône This rivulet is crossed twice first by means of the Bellegards viaduct comprising seven spans each of 60 feet in the close seven spans each of 60 feet in the clear by 150 feet in height, and secondly by a haudsome masonry bridge the Monlin des Pierres or Montangas which has a main span of 262 feet 81/4

At the latter crossing the river flows through a does prok zorse, the preriptious banks of whith are over 170 feet in height. The rock was found to be of such excellent bearing quality that the engineer in chief decided to the foundation of the control of the At the latter crossing the river fic provide width for two foot pavements a railroad track of meter gage and a roadway paralleling the railroad track

mount the great span on either sldc have semicircular openings of 17 feet 4½ inches clear They are carried on piers having a thickness at the top of 8 feet 6½ inches and the sldcs parallel with the axis of the stream have a batter of 1 in 10 from the point at which they rise from the

Owing to the depth of the rovine the erection of sive framework As the keystone of the main span is approximately 217 feet above the level of the water it approximately 217 seet above the savas of her water is was necessary to erect wooden falsework from the stream to the level of the abutments to carry the cen tering and this temporary work comprises three sub stantial towers built of wood and strongly braced

together. The towers were each some 113 feet in beight and were erected on masonry piers 13 feet in height built on piles driven in the bed of the wiream In creating the towers it was imperative that am ple provision should be made for wind pressure as



Timber falsework ready for the laving of the mesonty

the storms which drive through this raving an often of extreme severity. This was accomplished by tying the towers to each other and to the embankme and the pier bases by steel cables so arranged as to provide a system of braxing which served to hold the whole of the fatsowork perfectly rigid. The little character of the timber contenting is plainly visible in the accompanying litustrations and it may be mentioned that in this part of the work 21 1881 cubic In placing the masonry in position care had to b observed to guard against any sinking of the timber ing under the superimposed weight, and in order to

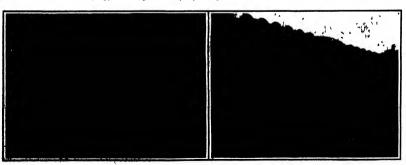
lessen the extent of any deformation from this cau leases the extent of any deformation from this cause the engineers caused this stonework to be laid in right sections independent of one another which were finally connected together. An actial cableway was exected across the gorge by means of which the Limber plons or intering and arch were

cricted the whole of the material is ting conveyed to its site and set in pon by this means

The bridge was commenced in Aus the bridge was commerced in Aug ust 1908. By January 17th of the fol-lowing year the whole of the timber falsework had be noted up and the erse-tion of the musoury was completed by Angust list last When the masonry work was finished the timbering was dismuntied the resonal of the centering was accomplished by emptying the boxes filled with sand on which the boxes filed with sand on which the various parts of the falsework frame risted which dropped the whole of the timbs ling sufficiently to cushic it to be handled. The falsework was demol-lahed without any movement being notied in the masonry by November 7th When completed the bridge will exiel in span any similar work ling in France while its height ever the valley which is equal to that of the tweers of Notro Dane in Paris is greater than that of any other i r single span masonry irrigit elsewhere it the world its jotal cost will approxi-

According to the Firstile Railway Journal exteriments with a method of increasing traction by magnetic wheels have been conducted for some time by Mr. U. Helmy of Lowell Mass. The wheel comains four magneticities out side of which an four segments compiring part of the water and a ling of 1 per cent manganess steel is damp d between them and the which impure to sand the mangate it cuit into the lail. The energiting of the mangates is so timed that each muccoding sutting of the wheel is allient ed to the rail just in advance of making

sides giving invested adhesion also assists accientien in current is out off from each assists accident the current is cut of from each sit using not as soon as it is no longer in contail with the rail. Tests have been made on a truck quipped with two 3 horse power flowed at and railway motors and weighing 11000 pounds. With the ralks ay motors and wishing 1 000 pounds. With this tuntion due, to weight show the moleon developed a drawins pull of '00 pounds. With the wissels may be pounds or more than 10 per 100. The instruction pounds or more than 10 per 100. The instruction of which is the pounds of more than 10 per 100 per



The messary of the main arch was laid in right independ

The arch has a clear span of 202 feet 93 inches; it stands 217 feet clear of the river-

OUR MARYELOUS AUTOMOBILE INDUSTRY

If ever an industry has grown by leaps and bounds, arely it is that of making motor cars. Even the bleycle In its unimiest days did not produce machintotal value for ten years could equal the truly enor mous sum of money represented by the automobile products made in the United States between 1895 and Mere figures tell but little For that res se have presented on the front make of this is graphic illustration, in which the wonderful strides made in the manufacture of motor cars are tellingly when it is considered that the Industry had to weather the severe financial depression of 1908, a period which was one of the most critical in the recent fi history of this country

idered merely from the standpoint of monay the automobile industry in this country presents a most wonderful spectacle. The total estimated value of automobiles to be manufactured in 1910 is \$237, 699 699 When the industry was born in this country, which was in 1895, the estimated value of the machines turned out was only \$157,000. In the brief space of turned out was only \$10,000. In the brief space of twelve years literfore, we have created an industry whose annual product is valued at millions. The later mediate stages between 1895 and 1910 show a growth which is stup udons. The stage from 1895 to 1899 marked an increase in the total value of nearly a milmarked an increase in the total value of mearly a mill lion dollars, the actual value of sutemobiles manufac-tured in 1899 being \$1,280,000 Still more remarkable is the development from 1899 to 1802, for the value ting of the automobiles product in this country increased tearly sixteen fold in that time, the actual value of an fomobiles produced in 1903 being \$16,000,000 Remark able as that increase undoubtedly was it was almost d by the interval from 1903 to 1907, for in 1907 \$105.000 000 worth of automobile mar bipery was many sion, owe one worth of automobile manufactured From the year 1807 to 1910 s 100 por cent increase is to be expected in other words, in these three years the More increase in value of the automo-bile industry will be greater than the total value of

bile industry will be greater than the total value of the industry in the year 1907. An industry which has grown with such startling appoints and which is valued at so princely a sum, naturally gives employment to an army of mechanics, and of them whitele men handsomely paid. Thus all of them whitele men handsomely paid thus we find that the mere wages paid for mechanics in 1910 will amount to about \$1100.000.000. The chamferers who drive the many cars which were in use in 1910 carn \$25,000 000 at the very least in 1910

The number of automobiles produced is nothing short of staggering. If all the cars of 1910 were placed and to and, they would reach from New York to Pittsead to and, they would reach from New York to Puta-burg, a distance of 438 fe miles This output of 200,000 is three times greater than that of 1997, considered from this linear standpoint, for the automobiles of 1997, had they been ulsaced end to end, would have extended from New York to Harrisburg, a distance of 19186 miles Compared with this, the 13-33 195 miles Compared with this, the 18,333 automobiles mannfactured in 1002 access executingly small, although as a matter of fact the machines for that year, had they been placed end to end, would have extended from New York to New Branswick, N. J., a distance of 29 26 miles. When this, small as it seems in comparison with the gignatic production of 1810, is huge when we consider that between 1805 and 1890 its 670 automobiles produced in this control was the second for the control of 1610, in the work of the work of 1650 to 1650 t tance of 1 46 miles.

17sd all the automobiles made in 1910 been converted into a single luge machine, the result would be, as our front page illustration shows, a rar which would be longer him in attending 181. Paul," measuring a 161 feet from air on teater P year the output of 1899 bad it been thus converted into a single machine, machine of 1802 similarly considered would have been three-quarters as long. The output of 1895-1890 is of vourse, vanishingly small in comparison with this ginantic trans-triantic steamer. Naturally an industry of souch Thanks proportions must be capitalised at militons. On the whole, it is made to expitation of the proportion of the proportio a single luge machine, the result would

mobile manufacturers is about \$250,000,000. The out-put for 1910 alone will surely exceed 200,000 cars. Even now there are over 180,000 automobiles in use throughout the country The actual number of employes in the industry is 125,000 in motor-car factories, with amoyée in paris (sctories reaching not less than 40,-0, a total of 165,000

Hand in hand with this increase in money value. ranne in mand with this increase in money wate, we find improvements in manufacturing processes. Five years ago, where a man would have paid from \$3,000 to \$2,500 for a tonring car, or \$850 to \$1,200 for a remaind the scarcely expreed to get much in the way of darability, or if he did, in the exuberance of un-sophisticated anticipation, he was almost sure to be disappointed before he had used the car many days. When we recorded the antomobile runs of those days when we recruded the antomobile value of those days in these columns, we susually had to recibe a series of troubles of various sorts, chiefly with tires carbureters, ignilion devices, as well as breakages and imperfect functioning of valve mechanisms, sharts, goars, chains,

steering knuckles, driving arise, and other vital parts. Contrasting this condition with the results of the Gildden Tour of 1909, we find that thirty cars took Glidden You'r or 1909, we mad tant three care took part in that run and finished an arduous trip of 3,404 miles in 15 days, at an avarage speed of twenty miles an hour during the daylight running periods, without making a single involuntary stop. That tells the tale of the wonderful technical improvements which have been efforted in the brief space of a few years. It is rarely indeed that repairs are made during runs now-

rarely indeed that repairs are made during reas now-days. Occasionally a brake, a reduceter, as ignition system, may have to be adjusted, or a tire may blow out, but the care operate amountly and irrustworthly. The introduction of special grades of steel, aimmin inn, vanadium, and babhit, all of them endowed with defailst physical properties peculiarly united to the conjuments of automobile manufacture, have wonerfully improved the quality of the motor car steel and chrome-nickel steel are now used in craph steel and chrome-nickel atcel are now used in crans-shaffs, transmission shafts, driving axie, driving and differential atcering gears, steering knuckles, and simi-lar parts, manganese-bronse, phosphor-bronse, and various aluminium alloys find their places in crankcases gear boxes, eteering gear housings, and parts de-manding great stiffness combined with light weight. The automobilo industry is very largely responsible

The automotic industry is very larguly responsible for the discovery of the physical properties of chroma-nickel steel and vanadium-chrome steel under different modes of heat treatment and for the introduction of special tool steels required to work them, and has thus indirectly benefited the metallurgical industry of this country As a result of the employment of these new steele in the sliding gear sets, by way of filustration, stores in the sitting gear sets, by way of illustration, it is now possible to transmit the 40 and 60 horse-power of the modern touring car with emailer and lighter gear sets than were used in cars of 12, 15 and 20 horse-power five years ago, and that with much greator certainty against breakage and the practical elimination of the mangling of the ends of the teeth by meshing and of wear due to contact under load. All this improvement in quality, plus infinitely more grace in general lines and in comfort to the passengers, is in general lines and in councry to the passengers, is offered to the buyer aimest at no advance in cost over the ungainly, unconfortable, and poorly-equipped care of all and seven years ago it is safe to say that a great proportion of the automobiles manufactured in 100 will be inwyriced care. The car that could be bought a lew years ago by the man of moderate in-come resulted close attention. Automobility at that come required close attention. Automobiling at that time was unquestionably a diversion for the rich Nowadays a man of moderate means can purchase an use a car at an expense that le well within the b

In the early days of the automobile industry, the manufacturer was under the necessity of making all his parts, to-day the factories actually making even 75 per cont of the parte that they use are in small proportion to the number of producers. It is to these changes that the excellence of the medium priced suto mobile is largely due. There was a time when an as-sembled car was undoubtedly open to suspicion, for however desirous a maker of its parts might be to do good work, he had notther the knowledge nor the facili good work, he hed nother the knowledge nor the facilities that would make it possible These anne companies nor possesse enurmous plants. Their designers and equipment are the hert obtainable and their products embody the latest and best in practive, workmaship, and material Assemblers now bave at their command parts of a high degree of excettence, and (an buy them at prices far below those charged for the weak and faulty product of former years.

When a monufacturer turns out twenty thousand cars a year it is not only justifiable but necessar him to invest very considerable sums in special ma chinery of all kinds that for a smaller output would be inadvisable. One manufacturer has spent \$40,000 for dies to produce a rear axle housing, on a production of one thousand cars, the charge against each for tion of one thousand cars, the charge against each for this would be \$40 With an output of twenty thou-and cars, however, the charge of \$3 against each is little enough for the purchaser to pay for so excellent

A recent development that illustrates the endeavor to reduce manufacturing costs is the establishment by some of the leading producers of assembling shops at ducers of assembling shops at the large centers. To these are shipped part tity to build the cars required for that locality, and as there is no equipment of machine to the expense is slight. The freight rate on unas nt of machine tools the expense is single. The Freight rate on unassem-bled parts is much lower than on complete cars, and the saving effected in time and convenience as well as in monay makes the system a satisfactory one. Vast as the automobile industry is, huge as is the vaine of its output, it must not be supposed that the

value of its output, it must not be supposed that the protist are illegislants. It is said to say that the present-day manufacture of medisappriod care makes a lettimate profit of the of the largued producers and a lettimate profit of the largued producers are in lettimate profit or care is less than \$100, zeroly not excessive when one considers its secondous investment in magnitude and parts, his vauly vast equipment of, machine tools, and his labor expenses. is labor expense.

It has been said that any average engineer our de-

eign a our to sell at \$4,000, but that the greakest of is necessary what the selling price is to be less of \$1,000. Perhaps that may account for some of the coedingly eleyer designing in the low-priced cars. The scene of the industry has shifted in the year

The scene of the industry has shifted in the years from 1885 to 1910. Much of the early experimenting in motor cars and early manufacturing was done in Buffalo, Tarrytown, Marion, N J, Bridgeport and Hartford, Coun, Philadelphia, Pa., and other Enstern States. At present Michigan tends all the States in States. At present Michigan leads all the States in motor-car manufactoring, for that State last year made 113,000 of the total production of cars for 1908. Your other States adjoining it will produce 75,075 ma-chines at least. The Middle West may therefore be said to be the real home of the anton dile industra at the present time It controls not only the car-mak ing industry, but the making of tires, parts, and access sories as well, a condition which is primarily due to the industrial enterprise of the smaller communities of the industrial enterprise of the smaller communities of the Middle West, who have given land and in every way furthered the making of automobiles. It must also be considered that the makers of automate imachinery are very largely situated in the West, for which rea-son the better class of aktilled labor is there to be found Lastly, the shifting of the industry from the East to the Middle West has been caused in over a East to the Middle West has been caused in part at least by the fact that the raw material is there put through its first and second processes, as in the case of rubber, steel, leather, wood, brass, and the like That the Middle West is undoubtedly benefited by

the indux of automobile manufacturers can be shown by the wonderful increase in the population of some of we wonnersus increase in the population of some of the smaller town. The infine of 2,000 to 5,000 families has doubled and trobled the populations of such olites as Filmt Mine, and Newcastle, Ind., and greatly en-hanced the value of real estate. Towns which were practically unineard of before the automobile entered into our deliy life are now thriving centers of inpractically unheard of before the automosus enterer into our daily life are now thriving centers of industry Communities with a population of only five or six thousand have their names brought home through the magazine advertising page to millions and millions of readers, simply because they are the and millions of readers, simply b sites of large automobile plants.

Cost of Various Methods of Illumination.

The Frankfurter Zeiting publishes the following remarkably complete table of the cost of various ethods of illumination

Cost of 100 normal candle hours

	Cents
Washington light	0 238
Flaming electric arc	0 381
Mercury vapor lamp	0 595
Incaudescent gas light	0 696
incandescent petroleum light	0 714
Direct current electric are	0 942
Osram, zirron and tungsten lamp	1 190
Kerosene burner	1 666
Osmium ismp	1 785
Tentalum lamp	1 904
Incandescent alcohol lamp	1 904
Alternating current electric are	1 904
Nernst iamp	2 023
Small are lamps	2 142
Acetylene	2 856
Carbon filament	3 808
Argand gas burner	3 808
Fishtali gas burner	5 950
Stearin candle	26 180
Who Washinston laws to an inco-	

The Washington lamp is an incandes which burns petroleum under pressure In complling this table the following average pri-for fuela and electrical energy have been employed

2 38 cents per pound 4 33 cents per ponn

Alcohol
4 33 cents per pound
Slewrin candies, 16 53 cents per pound
Gas , 107 87 cents per thousand cubic feet
Acetyjene , 509 07 cents per thousand cubic feet
Effectric onergy 11,90 cents per kilowatt hour,

According to plans formulated by Rear-Admiral Cowles, chief of the Bureau of Equipment of the United States navy, and submitted by him to Congress, wireless apparatus of the latest type is to be supplied unions enture navy, and submitted by mic Congress to all the new vessels of the navy, is to dies regulated to all the new vessels of the navy, is to dies regulated or and all auxiliaries, as this latter class of vessels are recommended to the proved very valuable in establishing virsions chains across long structures of coban without the horse station in consumption of the contraction of th

Scientific American

Correspondence.

PFITENER'S MONOPLANE.

To the Editor of the SCHRTIFIC AMERICAN

1 have just read with much interest an article in
your issue of February 12th under the caption "A Novel American Asroplane."

The monoplana has always appealed to me as being The monoplant and always appealed to me as being more consistent with the laws of nature, and therefore more succeptible of continued improvement and evantual perfection, than the biplane. The double of triple planes strike me as being contrary to the examples planes strike ma as being contrary to the examples set us by Nature, the artra planes being a superfluity of which Dame Nature is rarely, if ever, guilty it would be an incongruity for a bird to be supplied with more than one pair of wings, unless the duplex or triplex wings were acrompanied by a Siamose-twin or triples wings were accompanied by a Siamese-twin or triplicate body. As long as there is hut one body and one source of motive and controlling power, a single pair of supporting planes would appear to be all that is necessary if the planes are sufficiently extended to support the body at the speed normal to the bird Additional planes do not sufficiently compensate by their increased buoyaney for the increased weight unwieldlincreased buoyancy for the increased weight, unwheld-ness, and instability I therefore pin my faith to the monoplane as likely to afford an additional illustration of the fittest " the Darwinian theory of "the survival of the fittest"

of the situat" in Figure 2 design, according to my ideas, comes her Pfitners's design, according to my ideas, comes nearest to the ideal heavier-than-air giving machine than anything that has berestores been brought to my attention. I will be greatly mistaken, and disappointed as successful, if we do not bear from his machine ere long as accessfully rivaling aven the best of the hiplanes. But over Mr Pfitners's novel design is susceptible of improvement I cannot help wondering wby neither he, nor any other validors as it as at have been shill be the contract of the co

he, nor any other aviator as far as I have been able to observe, has adopted what I consider to be a very essen tild element of stability invarishly to be found in the make-up of the deminant of the air. I mean the invari-able disposition of the veight of the body to the sup-porting planes. Mr Pittners seems to have entired ignored this principle, like all other aviators, by placing his engine and driver's seat above or on a lovel with the supporting planes.

Nature, on the contrary auspends nearly the entire eight of the bird below the level of the wings or weight of the bird below the level of the wings or planes, ordeatily for the express purpose of securing stability. During flight, or particularly while searing, the extended wings of the husant (it adopt a familiar of their juncture with the body, while at the same time the head is lowered and extended forward, so as to bring it down to or beseath the plane of the wings While the bird is salling in a calm atmosphere, the legs and feet are drawn up toward the body, but it do a sudden gave of whel at the cut of the wings as a sudden gave of whel at the cut of the wings as the same time. to displace the center of gravity, the legs are at once oxtended in order to lower the center of gravity, and equilibrium is at once restored. This seems to me to be a wise provision of Nature worthy of imitation as

far as in practicable by the aviator.

With the engine, an apphibe and water tanks, as well as the seat of the aviator, rigidly suspended as far as conveniently possible below the planes, the weight acts litte a pendulum, the plumb-bob of the massen, or the ballast of a ship, its constant tackery being to restore the equilibrium of the planes the moment the disturbing force is removed. And in making a change of direction, if the radius of the surve is about the standards of the curve in about the standards of the curve in about the standards of the survey in a about the standards of the survey in a should the standards of the survey in the survey a change of direction, if the radius of the curve is abrupt, the endency of the outer plane to rise on account of lie increased speed as compared to the racted speed of the luner plane will be measurably combracted. With the weights so disposed, the exceeded planes will set like a parachete, and in case of the sadden breakdown ut the segtime or properly the combracted with the section of the sadden breakdown can be set to be set of the sadden breakdown can be set of the section of the sadden can be set of the section of the sadden can be set of the section of the sadden can be set of the section of the sadden can be set of the section of the section can be set of the section of the section can be set of the section of the self or his aeroplane

seif or his aeropiane
Were Mr Pfitsmer to raise his planes to the tops of
the vertical posts, and lower the engine, tanks, and
seat to a level with the axies of the carriage, he would
find that much less skill would be required to preserve find that much less skill would be required to preserve the equilibrium of the machine Possibly the propeller shaft about remain on a level with the planes, but if lowered just far enough, to esable the hindes to clear the ground, I apprehend he would be table to clear the ground, I apprehend he would be table to clear the ground, apprehend he would be table to plane unward would assist it in leaving the ground, once sedact, that tendency, if presisted its, conditionally the constructed by the proper use of the forward brainfast grader, without perceptibly impeding the property of th

would suggest another scheme for the rudders them be connected together, so they would more mison. When the horizontal rudder is always of in union when he horizontal ruddor is newtood or depressed in order to rise or descend, it would make no material difference if the perpentitedar rudder did she rise and fall in a perpendicular plane. It would produce no change in the direction in like manner, if the perpendicular reader should be turned to the right or left in order to alter the course, it would have no influence on the elevation of the machine. I possess but a superficial knowledge of aviation, and I have no means for investigation or experiment, but I have been intensely interested in the scloses over since the Wrights' operiments were first made The above thoughts came to me as I read and

pondered the description of Mr Pfitzner's novel device I make bold to offer them to you for publication if you deem them worthy of being embals C E McClura

THAT BUMBER PUBLIC.

To the Editor of the SCIENTIFIC AMERICAN
If your correspondent in the issue of January 22nd will study the following figures, he will plainly that it is not impossible to get 35 sets of 3 out of 1—15, so that no two numbers will be in the same set more

1-2-3 2-4-10 3-6-11 4-9-12	6 912
1-4-6 2-5-11 2-7-12 4-13-14	6-10-14
1-6-8 2-6-12 3-8-13 6-6-7	7 8 5
1-7-10 2-7-13 3-9-14 5-9-10	7-11-14
1-12-14 2- 9-15 4- 7-15 5-14-15	10-11-12
1-9-11 2-8-14 3-19-15 5-12-13	N-10-12
1-13-15 3-4- 5 4-8-11 6-8-15	11-12-15
1-2-3 2-4-6 3-5-6 4-10-14	6 912
1-4-5 2-5-7 3-8-11 4-11-15	6-10-15
1-6-7 2-8-10 3-8-10 5-8-14	6-11-14
1-8-9 2-9-11 3-12-15 5-9-15	7 815
11011 21214 31814 51012	7 914
1-12-13 2-13-15 4- 8-12 5-11-13	7-10-13
1-14-15 3-4-7 4-9-13 6-8-13	7-11-12
If he will carefully inspect the 30 sets of	f numbers

presented by bim in the same issue, he will discover that the numbers 4 and 6 are twice paired, icaving only 29 sets without duplicates

Milwaukec, Wis

Lewis Sherman

REBUILDING THE "IDAHO" AND "MISSISSIPPL"

Tu the Editor of the Scientific American As one of your readers, I have been for

Interest the proposals put forward by various gentie-men regarding the reconstructing and rearning of the different types of pre-dreadnought battleships in

in the March 5th number of your paper you published a letter from Mr W W Bass concerning a proposed rebuilding of the battleships "Idaho" and Mississippi' so as to make them usariy equal to the Louisiana" class. One of the objections put for ward was the impossibility of establishing a 10 inch gun in a turret built fur two 8-inch Why not ave gun in a turret built fur two k-linen why not avoid this difficulty by leaving the night 8 line, guns airready mounted where they are and then to increase as much as possible the 7-linch battery below? This would make these ships even more similar to the "I-Justians". I do not believe that the catting in two of a haitie-

ship would entail very great difficulties as a few years ugo a White Star liner was cut in two and a new bow hullt on the original baving been destroyed by an accident. A torpede-boat destroyer of the Brit ish uavy also was rebulit in this manner

But if it was deemed too expensive to build this section as proposed, would it not be feasible to sarri fire a few 7 luch guns and re-engine the ships with turbines of greater power thus attaining the extra knot and a half necessary to bring them up to the "Louisiana's" speed standard without the cost, time, and labor of totally rebuilding them?

New York, March 21, 1910

[The "Idahe" and "Mississippi" are so much shorter than the "Connecticut' that there would be no room for the mounting of additional 7-inch guns It would be useless to in stall turbines in the increasing their length and the cost of both changes increasing their length and the cost of both changes would not be warranted by the advantages of addi-tional 7 inch guns and the greater speed secured thereby The deficiencies in these ships are due to the artion of Congress in limiting the displacement to 13,000 tons—Eh.]

Boath of Alexander Agnesia

Prof Alexander Agazets died on the steamer "Adriatio" on March 29th, white on his way to New York Hardly tens famous as a scientist than bis father, be Hardly less famous as a scientist than his rather, be was noted not only as a biologist hat as a mining engineer financier, teacher and man of the world. In his life he combined the activities of president of the his life ho combined the activities of president of the Calumot and Heck Mining Company and director of the Museum of Comparative Zoology at Harvard, founded by his father Prot Agassia was born in Neuchatel in 1855 and did not come to this country until he was fifteen. His early education was re-ceived in Europe, attempt he was produced from Rayrard with the class of 1855. He sharted by the life as a civil engineer, and did much valuable work as assistant on the Atlantic Geodetic Coast Survey Elis work in that field naturally drew his attention to the natural sciences. He began to collect fishes for his father, and thus was induced to follow in his father's footsteps. After that his activities were at-most equally divided between scology and mining

ndy of the copper mines of Poru and Chill led A study of the copyer mines of roru and Chini sea him to a survey of Lake Titicara, and also to collect Peruvian relics, which are now lodged in the Pea-body Museum at Harvard Five years of his life, from 1876 to 1881 he spent in deep-sea dredging ills blo-logical survey of the waters of the Cuif of Mexico and

the Caribbean Sea is still regarded as classic

His exploitation of the Calumet and Hecla mines to his profit secured the means to gratify his fat ambition, the erection of the great Harvard Mu of Comparative Zoology

or comparative Zoology
He made by his persistence and ability in argument the development of the Lake Superior copper
terrilory on Keweenaw Point (and now later traced to the mainland) a certainty

Beath of Hermann Muedabook.

Oberstleutnant s D Hermann Mordebeck died re cently With him there has passed away one of the most ardent advocates of acro-navigation Thanks to his efforts the Deutsche Verein fuer Luftschiffahrt is cluded in its programme meteorological measurements.

As a young lieutenant, Moodebeck became a member of the Deutsche Verein zur Fördorung der Luftschiffahrt. As a captain he founded in Strashurg tha Oberrhoinische Verein fuer Luftschiffahrt, and pub-Observations and the version that I discontinuary, and published its official organ, liturative Accountantiache Milteliungen, now the official organ of all the German aeronantic societies in 1907 Mondebeck was promoted to Obsertieutanta. A year later he rutter from active army service in order to devote his entire time active army service in order to devote his entire time to aeronautics He was a momber of the luterna-tional Commission for Scientific Aeronautics and a charter member of the International Commission of Aeronautic Majes it was only recently that he founded an zero Lutthottenversin fuer Berlin und Branden

Beath of Galen (lark.

Galen Clark, who died in Oaktafil Cal, ou March 24th, had been known for the last half century to almost every tourist who has visited the Yosemite Valley While on a hunting trip in 1857, he discovered valley while on a untring trip in 18st, no discovered the great rodwood grove at Mariposa Boon after that Clark devoted much of his time to exploring the upper heights of the Sierra Nevada Mountains, and made known to the world much of the beauties and wonders of the hig tree groves and of Yesemite

The Current Supplement.

In the current Supersynty, No 1788, Mr P M'N Bonnie reviews the recout work which has been in the electrical reduction of iron and steel There is much contrasion with regard to dyestums and the colors which they impart to the testilis fainty of the testilis fainty of the testilis fainty of the Sone very interesting movestites in toy are described and illustrated Lieux, John C Solely exhaustively additionates the oil fedds or the Gulf of Mexico and the contrast of the Court of the C is much confusion with regard to dyestuffs and study of the sun is concluded Halley's comot is now visible to the naked cyo just before dawn in the east-ern sky, for which reason Mr George F Chambers's most thorough article on this interesting wanderer is published with peculiar timeliness. One of the most important articles in the Supplement is Mr Aston's acrount of the recent Olympia aero exhibition by far the biggest of its kind which has ever been held in

According to the Engineering Record improved boller perferensive has been sitalized at the Anderson station of the indiana. Union Traction Company by preventing the leakage of air from the subjust around the ends of the chain grates into the flues. This is accomplished by first fining at lanh outra-bacy pipes arosa the frames 8 inches from the rea-of the grate, with its lower surface 3½ inches show the top of the grate. There is a zone of about 10 inches between the center of the pipe and the rea-fre box wait, which is covered with a course of fir-brick. This shelf prevents the passage of all which the pipe holds the body the course of all chains. boller performance has been attained at the Anderson burned into ash, which the grate can carry back under the pipe in the desired manner. Inside the 4 inch the pipe in the desired manner inside the vipe in one of all nich diameter running from one end mearly to the other. Cold water is admitted through the small pipe and flows back through the large one, the rate of flow being adjusted so that its final temperature is just under the belling point. The hot water is discharged in a way that permits its condition to be inspected, into a beader delivering it to

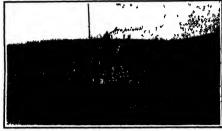
OUR SEACOAST DEFENSES'

BY CAPT. H. E. CLOKE, U. S. ARMY

When the Complimates of the United States was framed creating a republic in ferm of government provisions were made for the creatin of military and naval force and for the exist a f the purpose of r pelling of invasion f blate troops for

Owing to the fact that access to our coast fertifica-tions has in years past been prohibited to the olti-zens of this country it is not surprising how few men-understand the method of fring a high powered gun or a modern moriar For this reason the following de

duty for in case of imminent attack the men sleep at the guns. The battle commander then notifies the fire commanders by telephone of the approach of the fact. The fact would probably be piloted up at ten-or twelve thousand yards. At this range all the heavy





I lead on fo 1 | restic like it is type f long and gg | lea may led for gree | Bloss and slift be ford more registly |

The range finder is the cyre of the system while the toke poor and identifying any the nerve |

The hitting power of a best ry absolutely depends upon its maps fador.

The hitting power of a best ry absolutely depends upon its maps fador. Positions of detachment at command "I oad" for 6-inch disappearing rife.

A range-finding room. (B' station)

No better service to sid be 11 and red to the country and there is no service that should a peal most et the particular of our Batte troops than this and particularly the troops of those 'Batta which border the coast in a derended Our cangained State altitude and the various labor organizations should be at taxted to the subject of coast of these for the reason.

that off to this subject or count of times or the reason that me in a six to organizations or unable to leave their families and business interests and entite the motoral arrive in time of war. If they were organized as a difficulty force for the protection of their hours against invasion the defensive force of the Blata and country would be in reased by a body of the Blata and country would be in reased by a body of the Blata and country would be in reased by a body of the Blata and country would be in reased by a body of the Blata and country would be in reased by a body of the Blata and country would be in reased by a body of the Blata and country would be in reased by a body of the Country of the Blata and the Blata the cost of two Diradnoughles it costs about \$600 every time one of these guns is fired with an armor plerving explosive shell but one of these shells if pierring exposive anil but one or towe annus in directed at the proper point on a modern battleship will indict hundred of thousands of dollars worth of dhamage. Athough one submaints mine charged with a hundred mounds of nitrogiverine costs about \$700 il may if exploded underneath a battleship send many millions of dollars to the bottom of the asa. On the oth I hand the life of the 12 inch guns without refiling is only about 240 pounds that is to say fir ing one shot every thirty seconds (the time of fice of a 12 inch 11ft.) the gun becomes uncless after a two

scription illustrated by the different drawings is given let us consider the enemys fleet to have been sighted on the horizon and headed under full steam in column formation for the entrance of a barbor. The tisck is being made during a inte bour of the night in the discovery of the leading ship by the powerful



It oil the toise-cape of it is hastroniest are vertical and is oriented to take A oil a expider. If the Circusts is released if take the A oil a expider is the Circusts in released in the A oil a expider of the Circusts in the A oil and the

Lewis position finder.

searchlights of the defense the battle commander di rects the sounding of call to arms Within ten seconds every soldier is at his station or post for

OFR STAGOAST DEPOYERS

batteries including mortars are directed on the lead ing ship The probability of hitting her by this means would of course be greater than if the fire were dis All guns attack the side armor and to of a battleship while the morters attack the decks.

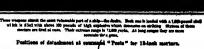
The searchights of the different fire commands are now concentrated on the leading ship while the battle

The searchights of the different for commands are now concentrated on the leading ship while the bettle command lights are searching for undiscovered ships in order to fiss modern 15 their smith childward in order to fiss a modern 15 their smith childward in order to fiss a modern 15 their smith childward for the same of the range and the amount of defections to be ston the sight if the sun were merely set for the range from the grun to the target the probability of hitting would be very small. The errors that enter into the range function are as follows 1. The accelerating or rotarring component of the wind 2. The variation of the beight of the grant development of the state of the st carget. These corrections must be applied to tha range with lighting rapidity it is accomplished by the use of certain mechanical contrivances which are located in the various fire control stations of the fortress The deflection correction to be set on the sight is

The deflection correction to be set on the sight is the algebraic sum of the component of the wind the drift and the speed of the target and it is determined by means of mechanical devices located in the plot ting rooms. The following then would be the method of determining the range and difficulties to be sent to the guns by telautograph or telephone At the simultaneous ringing of the bell in the primary

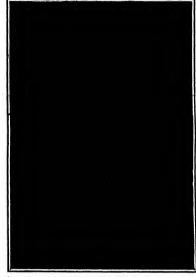


B is in this room that specially raised new bearmine from data received from the mage finder the mourse of a tar, I am I its prefer of a silton. This predicted range is sent to the gene of a battery and by the ring. I a bet the predicted than its nanounced and the graner free by clearly intelligent and the graner.



Scientific American

and associatory gitations, the observers at the instruments read the estimation and the instruments read the estimation are immediately photost on the plot in the plot of the



Props of these deadly swapons of destruction are planted across channels to keep the enemy one. The straints are briefled while send are activity controlled the na executate on the short tent of an extended on the short of the straints mining of our army is a great them in a factor that engineering. The principle of its operation are begin erect. The high explosive is entiated in the footing must eigher

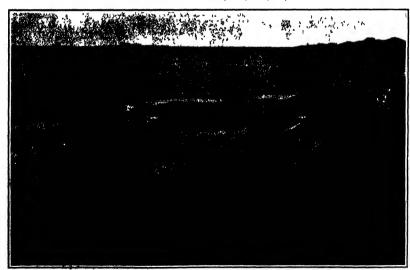
(Redraws from Loke s Dis Gunner a Francisco | published by J hu Wiley & Hone)

the drawing. The astmuth of the winds also sent by the sance means. The components in the direction of range and deflection are determined by means of a device called the sind component indicators shown in the picture. The atmosphere correction is determined in increase the meteorological station and is gent in over the seroes ope. The height of dies in determined by a tid gase. In dies in the dies is determined by a tid gase in the seroes operated in the diese of the diese in the

Owing to the fact that there corrices may be either additive or sub tractive and that the use therefore, of a negative sign tends to confuse the gunners in the jetning room to corrise the gunners in the sign tends to confuse the gunners at the sign that the contract of the sign that the sign tha

ann fire
The fire control system of our cease
strillery is also very firstible. If the
borizontal base system fields (each observing instrument at the primary and
sucodary statisms can be used as a
vertical base range finder and the ayem is so arrange finder and the arrange finders (axept lists of the fire
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range finders (axept lists of the fire
data for fitting than a
purthermore if all the stations in
cluding the fire commander a should be

(Continued on pay 3%)



This diagram shows in a passed well the exemptation of an exploidate leading. The publishes of the enemy is found by observing the angies the inity makes at two observing stations. If success it is not of a common has fine of known largel. This suggist are independed to the gra

From descript by Marier Ottorer Extra.

A typical battery command.

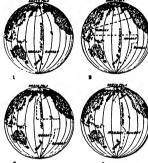
CIVII. DAY OUR

ITS ARRIVAL ON AND PROGRESS AROUND THE EARTH BY DANIEL ARTHUR

A few generations before our era the "whole known A res generations source our cracker whole know world was only some 2 million square rather in extent desired of nearly 2on williams as we now know That great observer and geographer Fratoschenes made That great observer and geographic Frincoshenes made a noble ultrarial about 25° In C in draw a map of the "World" in even used lines which tooked very like parallels of initials and ijriks of longitude These lines were largely based on the speed records of traviters and hance were not very accurate There were no such refinements un his non international date lines or time zones. His gendig wide cost and west by 60 deg long nurib and south It was all above our equator, and extended only about a quarter of the way around the earth

nertiar west and note some related conspect on the northern seed of the Nettermann, has senger on the northern seed of the Nettermann, has seen at the new particular Magelian trassed the Atlantic from the east he pussed around flouth America crossed the Parlitt, discovered the Philliquin Islands, and went home around the lower end of Africa thus completing a trip around like world. This trip was made less than trip around the worm that trip was more easy than four hundred years ago, yet when the explain is arrived at their home country they were astonished to find that they carried a date on board their slilps which tast oney carrier a onto on court mere stills want on was a lay earlier than the home date. It was soon found that no mislakes were made on the log books as to the time records and that the home calendar was cortainly correct. The explanation of this seem

to a set of questions sent by the writer. The map, together with the questions and the answers, will be found on a recent Paulin chart issued by the Navy Department To describe the line, commencing at the northern end, it will be seen that the first deflection of practice is to the cast, to give the tip of



liceretical state line 2 Date line when Alaska took date of Russia as Philippines took d. is of Pintis 3 Date line after purchase of Alaska and Philippines took Asiate date 4 Present international date line

Fig 1 -The evolution of the international date time

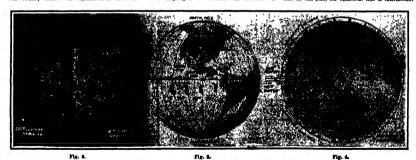
pir Then after the line passes through Bering Stratt it hears to the west, crossing the true line of 180 deg and far enough beyond it to take in all of the Alculian islands to the American date, after which it turns back to 180 deg , where it stave until it cross turns back to 180 deg, where it slays until it crossess the counter a few degrees, at which point it again deflects enstwardly to give the Tonga islands the date of Australia The line then returns to the 180th nieridian and continues on that line to the south

The foregulng is the 'international date line' of

1848, to bring those inleads into accord with the date of the countries east of the Cape of Good Hope. When Alasha was acceled by the United States, the date line was translared west of their territory or into Bering Strait. These two radical changes mades the Bering Strait. These two radical changes mades the Bering Strait. These two radical changes mades the Pig. 1. Netor to Pig. 3, which is intended to show the entrance of time on our globe. The picture illustrates a machesized deletery of our civil day, month, year, or century by means of an equa torial tape. Let us assume that the earth is stationary and that this tape centers and despars under the date-line reliers as shown. If the tape had a speed of about 1,040 miles per hour and we, it would show just how our civil day onners the earth and progresses around it with a constant motion would show just how our civil day onters the earth and progresses around it with a constant motion. The illustration shows the front end of the twen titch century as having completed is hours of the first day on earth, leaving only 6 hours of the ninciscenth rentury to gifled toward the line and off, to no one knows where Tha front end of off, to no one knows where Tha front end of off, to no one knows where Tha front end of off to relate it is the door to relate it, just as December 3 let steps out. door to enter it just as December Siet steps out, as it were Then we have the twentieth century all over the carth with January lat reducing its equatorial width at the rate of some 17 miles per minute and January 2nd growing breader at the same velocity. This of course is assuming that time is entering normally and not by the arbitime is entering normally and not by the arbitrary intermittent steps that we will call the twenty four way stations of our civil day. This latter system is in successful operation in the United States and two or three other leading nations. China being one of the more recent converts to the hourly sone system.

vertate to the hourly some system?

Fix 3 shows the earth with the hourly time betts or some outlined from pole to pole. The lines draws are 15 dee, part and represent the boundary lines of these somes and sight their location. Fix 4 is the same expelled as viewed from the north siar In high little-criticals between triblens the United States are outlined in suproximately the correct tocation, as as to show the insertical boundary lines of the hourly somes as insertical boundary lines of the hourly somes as to show that the second of the seco drawn and what our United States are actually using in theory To illustrate mechanically the delivery of time on this plan, our equatorial tape is intermittent



Haw the tweatleth century was sale ored in—a mechanical parallel. OUR CIVIL DAY-ITS ARRIVAL OF AND PROGRESS ARREST THE BARTS.

ing impossibility was soon forthcoming, and our date line was born lu fact

the was born in fact

As no one wanted the line near his home or coun
try, it was put to the most out of the way place possi
ble, where it still stays The 180th degree meridian is in theory where each new divil day is born, but in practice it has never been strictly adhered to Fig 1 diagram 4, shows its to ation with the deflections of penetice as they new exist on the official map at Wash-ington. This map was made by the flydrographic Office of the United States to illustrate its replies

practice at the present time, but in former ge practice at the present time, but in former generations the deflections were considerably greater, as or cample the one shown in the second diagram of Fig. 1 in this date line Alanka was taken into the day of Russis, to which empire it formerly belonged. The line then took as weeterly aweap of thousands of miles to take the Philippine Islands under the date as writerin 18 pain. This latter with deflection was mirror with the principle of the Philippine Islands under the date as writerin 18 pain. This latter with deflection was retreated with the property of the Philippine when he deem of the Oceanner General of the Philippine when he deem that December 31st, 1844, he reckned as January 1st,

in its action, that is to say, it jumps 1,640 miles and then stands still for an hour, which means that on the twenty-fourth jump on any day of a given name, that (Continued on page 267)

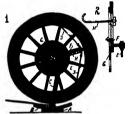
*Since writing this price is han cause to my socies that Orbit of its Assertan loss given up local time which was it ministen ahand of VI. State seaters some and, to quest the Recregipal vices, the Orbit was resided to live the same if ministen to the over "The changes conceptioned by sirving a sea it living". At M on a given the other was a state of the Whitehalton to the other was a state of the was a state of the other was a state of the was a state of the other w

Scientific American



NOVEL AUTOMOBILE PUMP

Pictured in the accompanying engraving is an in-Pictured in the accompanying engraving is an interesting form of pump, that may be used for inflating an automobile tire. The device is arranged to be operated by the automobile itself it consists of a bese A. on which is mounted a lack need to raise an operated by the automobile their interest of the automobile when a pround. The base A carrier a frieo B, which is designed to assist its positioning the automobile when the report of the pumping device before the fact the size of the automobile when the property of the control of the control of the control of the control of the automobile when by a derive above to learnly in the convenctional view (Feg. above to learnly in the convention view (Feg. above to learnly in the con



HOVEL AUTOMORILE PUMP

3) A slotted plate F is provided with teeth adapted to engage similar toeth on a solited plate G be plate G is provided with a crauk pin, to which the plate G is econnected. The plate G is provided with an apertured extension, adapted to fit over the arise of the automobile wheel T plate F is strong at a rise of the automobile wheel T plate F is strong at the plate F is strong at the plate F is strong at the with a plate F is a plate F is a plate F is a plate F is a way a rigid connection with the wheel is nearly By toosening the thumb nut on the hook. If the plate F may be more than th A slotted plate F is provided with teeth adapt by successing the thumb but on the hook H the plate f may be moved up or down on plate G so as to adjust the parts to wheels of different sizes. The distance from the crank plu to the center of the wheel however, is fixed in use the automobile engine is op-erated to rotate the wheel, and this action carries the pision up and down in a cylinder, the latter rocking back and forth to accommodate itself to the lateral throw of the crank pin A flexible tube connect the throw of the crank pin A flexible tube connect the pump with the fire that is to be inflated. By this ar-rangement a tire may be inflated vory rapidly, and the inflation carried to a further degree than is pos-sible by the manual operation. By using a speed at inchment of any of the well-homour typos, the burst ing of (fires due to accessive pressure may be avoided fris investor of this automobile jump) is Dr. Richard A. Goeth of San Antoulo, Toxas.

COLLECTION BOX FOR MAIL CRUTES.

Collection boxes at the termini of mail chutes are frequently filled to such an extant before the mail is removed that when the collection is made the mail tumbles out of the box on opening the box door and tumbles out of the box on opening the box door and falls to the floor in spile of every receasition taken by the collector. To better this bethersome condition a box has recently been devised which is previoled with a platform having foldsake side walls that permit the platform to every developed when the door of the box is opened and serve to prevent the smill matter from failing from the box. The countractions of this



COLLEGRICH BOX FOR MAIL ORUTES.

box is clearly shown in the accompanying engraving Fig 1 shows the box door open with the platform A swong down horizontally The platform is provided with two side wall plates B rigidly securwith two able wall plates B rigidly secured thereto and a sertice of sector abapted plates O Near the for-ward edge of each of the plates B and C is a groove D adapted to receive a pin mounted on the adjacent plate, while at the opposite ends the plates of each side wall are mounted on a cummon hispe pin This parmits the side walls to close up somewhat after the manniar of a fun to the position induced to Fig 3 The incurrence sector G is provided with a long S, which The innermost set for C is provided with a jug E, which engages a lip formed at the top of the bex and limits the outward swing of the platform A. To percent the interest of the control of the bex is provided with two guards F which extend below the upper edge of the plates. In such exhen the platform is lowered the letters in the box will turn be out through the door opening and will be caught by the platform and side walls. The investor of this content of the control of the contr care of T J Kelly, 29 South Eleventh Street, Lincoln,

A NEW SOUPDING POARD FOR PLANCE.

The soul of a plane is its sounding board That
sunding board is composed of wood carefully selected and carculty seasoned, so that it will remain constant in quality for the many years during which a plano is used. It is srehed or crowned against the pressure of the strings so that the strings and the so ing board may vibrate in harmony As the plane ages the sounding board flattens. In an upright plane this flattening is accompanied by 'buckling back" or cracking The result is that hard motallic so-called "tin panny, tone so characteristic of old planos it is obvious that if some means were provided for permanently arching the sounding board against the pressure of the strings, the plane ought maintain its tone for years without any tendency of the sounding board to sag

The attempt has been made frequently Some auployment of tension rods radiating from a center hub to the sounding board rim, but so far as we are aware to the sounding noard rim, but no rar as we are aware no one has ever successfully equipped the upright plane with a sounding board so constructed that it sould not lose its arch in time A sounding board or this type which has been successfully applied to an upright plane has recently been invented by Mr Frank B Long of Los Angeles Cai and is illustrated in the accompanying engraving
What Mr Long has done can best be understood



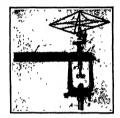
TRUSION DEVICE FOR PLANO SOUNDING BOARDS

when we consider the true function of the sounding when we consider the true function of the sounding beard of a plane The sounding board serves to sus-tain and amplify the tone produced when a lansmer strikes the strings. He Long has increased the ton-suataining and amplifying quality of the sounding board by firsthic reinforcing means interpreed be-tween the sounding board and the sounding board frame, thus equalities the installity of the wounding frame, thus equaliting the next builty of the sounding board and at the same time maintaining its ristion to the sounding board frame, so that the greatest po-sible vitailty of the sounding board is insured From the accompanying illustration, which shows the front of an upright pisno with Mr Long's sounding board of an upright piane with Mr Long's sounding beard in position, it will be observed that the edge of the sounding board is subjected to pressure from screw posts interposed between the other of the sounding board and the beary back frame "The pressure is or condensation of sound waves in accordance with the principles suggested by Heimboltz in his work on Bennation of Sound" Busides creating this reflect ing effect, the pressure post serves the additional pur pose of maintaining the crowned sounding board in The back frame supporting the its original form unding board is reinforced by diagonal tension rod tood across each corner, as shown in the illustration

The edge of the sounding board is rabbeted and used into a continuous laminated rim built up of hard maple veneers or layers so as to produce as exceedingly strong construction, which, however, is sufficiently fiscible to yield under the pressure posts, with a view to equaling the outward pressure on the sounding board resulting from the stretching of the sounding occur resulting from the stretching of the strings over the surface. By the use of screw pres-aure-posts, any shrinkage or expansion of the sound-ing board and the rim can readily be equalised so as to preserve the tone and even to amplify it 'ho arrangement is such that a proper reflection of the vibrations of the sounding board is obtained, as the strain on the sounding board by the strings is equalized to reflect the tor

As a possiti of this new combination of sounding board rim and pressure posts a small upright plane can produce a tone which is comparable with that of nail grand plane, and the full round tone of the new unright plane is preserved because the sound ing board is maintained in its original arched post-

EDUCATIONAL APPLIANCES FOR DISPLAYING OBJECTS. In the instruction of projection mechanical drawing, descriptive geometry, etc., it is important to be



EDUCATIONAL APPLIANCES FOR DISPLAYING ORIECTS

able to show students a skeleton model of an object. large enough to be seen by an entire class, and which will show front and side elevations as well as plan and bottom views. Heretofore this has been done by using a glass box within which the object was placed, or by using wire screens for the sides of a lox, which per mitted the teacher to chalk mark the outline of the object. An improvement on this system is offered by the invention illustrated herewith it consists of a stand provided with axes that have automatic stops at quarter revolutions to arrest the model in various positions The apparatus comprises a vertical shaft A. on which is mounted a table R that carries a support G, provided with a pair of upwardiy extending arms. The support C has in its lower face four revesses adapted to receive a spring pressed atop pin D. The revesses are positioned at quarter revolutions of the support. nted in the arms of the support is e shaft on arounced in the army of the support in a season to when the serve secured the square blocks E and P. The block E is formed with four recesses adapted to receive the Bin G. The blocks are adapted to receive a clamp If that carries the display stand J. Model K is shown supported on the study. First display stand may be moved about on three knew which are sitted with index els so es to incline or turn the model about to any where so we unreal or the discontinuous desired angle. The inventor of this oducational appliance who is by Hermann Haustein of 2019 Mohawk Street Chicago, ill. Informs us that he has used this display apparatus effectively in his own classes.

IMPROVED DETACHABLE WINDOW VENTILATOR

The vontilator which is illustrated in the accompanying engraving may be detachably secured to the window casing so that the window may be opened a short distance to permit the entrance and oscape of



IMPROVED DETACHABLE WINDOW VERTILATOR.

Scientific American

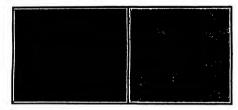
the end of the slat. If a large tool is used all the weed will be cut away except a single tenon, but if a smaller tool is used a central tenon may be cut, leaving enough wood projecting at each end of the slat to form enough wood projecting at each end of the sant to norm two more tanona. In this way a slat with three tenens can be formed, and by properly choosing the size of the tool and laterally adjusting the pedestal the slat may be formed with two tenons. The inventor of this slat tenoning machine is Mr José Ojanguren, Calman del Monto, Ne 356, Hawana Cuba.

IMPROVED JACK BLOCK

When the towned beginner or brosses of a refirmed

with the secondary star wheel It. The grip secondary star wheels L and I are loosely the secondary star wheels L and N are locusty sequences cooling on their respective shafts, and are housed be-tween separators M in such a mainter as to prevent them from shifting thereon, yell searing these two to rotate with the shaft wheever it may be necessary for them to do no to ring the best-inging mechanism. The star wheel L is provided with tooth on its per-The star wheel L is provised with teeth on its per-phery, which teeth are adapted to engage rods project-ing from the star wheel N, whenever the star wheel L is released by the angle tripper JK. The teeth of the star wheel L engage a side O, connected with a retractile spring-controlled clapper PQ, which rings

April of Table



IMPROVED JACK BLOCK

strike the under side of the inner part of the damper, illfiling it up outsil if the wind is strong enough, it strikes the buffer E. When the window is closed it possitively closes the damper by bearing against the outer section H. The branch is on which the casing is mounted are extensible so as to permit of using a standard length of vertilator with windows of differ sammar regard retributes with a spring ex-ent size East brack it is formed with a spring ex-tension A, provided with a ing which is adapted to engage a stop pin on the window sash, and prevent the window from being raised (on high Bloudf it be desired to raise the window further it is a simple miller to withdraw the spring catch M. The inventor of this vontilator is Rolla M. Hill care of the Economy Ventilating Co. Metropolitae Tower, New York.

TENONING MACHINE

The machine pletured is rewith is designed to cut cylindrical icnous on the end of a wooden stat, particularly for use in window blinds. Window blind stats

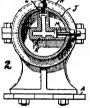
nir Furthermore, the ventilator is provided with an automatic damper, which acis to prevent the entrance of measurally strong currents of air and is fitted with

a buffle which serves to keep out rain or snow. The

a notine which serves to seep out vanior value. The account of the vocatilator, as indicated at A, is quadratical account of the control of the window casing. The lower order of the standing lengthwise and serviced to the window at B, with a light that cagages like all of the window. Extending lengthwise of the ventilator is a law C, which is formed of wheel metal heart back upon itself to form a helder for two parking strips D and R which is termed of the the control of the parking strip. D is adapted to it against the mask of the window, while the other strip arraws as buffer for the damper. At the appared to it were a substantial the said of the window, while the other strip arraws as buffer for the damper. At the appared to do noting the law everlies of the said of the window of the strip with the service of the strip of the strip with the service of the strip of the strip with the service of the strip of the strip with the service of the strip of the strip with
so that the damer will terreally come to a balance of the axis L. When the window is raised the damper awings to the horizontal cosition as indicated, but if a strong draft bloss through the ventilator it will strike the under side of the inner part of the damper,

as become worn it is necessary to lift the journals by means of jacks so that the brasses may be removed from the car axio, and be replaced with new ones When operating the jack it sometimes happens that the car wheel is lifted with the journal and devaled The purpose of the invention lituatizated in the accumulating exparating is to provide a device which the termal is belief to the provide a device which the provide a device with the community of the provide a device which
cast iron or steel, and in constructed in the course of grating with the edges scalioped or corrugated so as to insure lightness without un ness without un duly weakening the sucture. At one end the block is provided with an extension B, terminating in a toe C, which is adapted to fit over the rim of the car wheel. the car wheel.
The jack block
is rested on one
of the silis of the ties of the jack is seated on the upper fa

of the block close to the ex tension B When



usually are provided with a single central tonon, but there is another type in which twe tonens are used, and sometimes the slat is provided with three tenons. The machine is designed to form any of these type The mathine is designed to form any of these types of slats. It consists of a base A provided with a central bracket B formed with two brarings C in which is mounted an arbor shaft. The arbor shaft is provided with a pulicy B between the bearings, and may be fitted with tools, such as shown at F and C which depend for their form upon the nature of the work which they are to do. Opposite each and of the arbor shaft is a pedesial II filled with a head J. In our Illustration the load is broken away at the left hand side of the machine to reveal the interior construction. A rosses tional view of the head is also shown in Fig. 2. The head is formed with an interior web K, and the web is formed with a pair of channels that intersect at the center of the head. At the upper end of the vertical cleanue) and at one end of the horizontal channel is a spring such as shown in Fig. 1, which may be adjusted by means of the screws L and M, to be anjusted by means of the acrows L and M. to bear against the work which is placed in the slot. It will be understood that the head J is revoluble within the pedestal H. This pedestal is connected to the base A by means of a pair of hoits which pass through alots in the base plate thus permitting of a lateral adjust-ment in use a sist is inserted in one of the channels in the web K, and the end of the sist is brought into contact with one of the cutters en the arbor shaft The sist is out of alignment with the axis of the tool and then when the sisi is fed against the tool and the head I is revolved a circular tenon will be but to

the Jeurnal is Jacked up the too serves to held the wheel to the rail, relieving the upper journal bearing of the weight of the car and permitting the wedge and brasses to be removed. For convenience in carry-ins the block about a bandle D is arranged at each side of the block, the tootation being such that the block is believed when litted The invostor that the block is believed when litted The invostor of this lack block is by James Alles Gray of Gour the journal is jacked up the too serves to held the

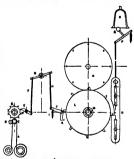
d'Alene Idaho

RINGING CRIMES BY PRRPORATED MUSIC SMEETS. time of the pioneer inventors of the automatic plane player, Mr John McTammany of New York city, has a system of ringing chimes of bells by p ferated paper music sheets, such as are employed in pisno-playing mechanisms. Mr McTammany's scheme was evolved as part of a huge memorial to be erected to the memory of the men who fell in the civil war to the memory of the near who fell in the civil war. The memorial assumed the form of a monament in which such Bitale was to place two bells. To rings so extensive a chine by hand would obviously be a task involving superhuman meacular power, Eres the present mechanical and electrical methods would probably full because of their complexity Hence, lift Wichmanny deviated the very impanious gyrdem which were the properties of the complexity of the control of the control of the complexity of the control of the con

McTanumary devised the very ingenious system which is brer illustration under about A is guided by a roil B, and passes over a growed roil O. The pins of a dering wheel D are adapted to engage the perforations of the music about A. The pin wheel D is operations of the music about A. The pin wheel D is operations of the music about A. The pin wheel D is operation of the music about A. The pin wheel D is operating of P, a row is about Q, a connecting roil P, and an angle tripper JE, with a primary stap, wheel L, which consists

the bell R The several shafts litustrated are geared together in such a manner as to cause the several parts to co-operate in definite order

A toth of the wheel D having salered a groove of the feed rell of through a perforation in the music sheet A, the wheel D turns on its shart. In so doing it engages the dog S, which is turn through the con-necting road F and B trips the angle tripper JK, thus releasing the secondary star wheel L, which, by the releasing the secondary star wheel L, which, by the shift of the shart, rotates into congenement with the side O, thereby pulling the sided dewn and withdraw-ing the chapper from the bell Whan the sides are tis secondary to the star wheel L, tha retra-cise of the chapper is the side of the star wheel L, the retra-le spring of the chapper is the side of the star the part dies the side roll, and is prevented from rotating ex-cept when one of its teeth fits into a perforation of



RINGING CHIMES BY PERFORATED MUSIC SERBIS.

the sheet and into the grooved rell, which turns the primary star wheel one degree.

The playing of the bells can be governed by clock mechanism, so as to strike the quarters and the hours and to play airs at stated intervals.

A new form of necessary interrupter has resembly been invented in which there are not reciprocating parts, but the interruptions are produced by a ripple formed in a siresan of movement. The mercury is contained in a reverleting vessel within which a contact-piece is fixed. The mercury is thrown by contributed not never in the property of the vessel. At one point the stream of mercury is obliged to pass over a contact piece the interruption contains a ripple or wave, and the contact piece of the interruption of the interruption may be varied by making the deficient revolute slowly in the same directles as the vessel it revolves why in the same directles as the vessel it revolves why in the same directles as the vessel it revolves the containing of the high points dispositly dispositly, in latting it.

305

It is Easy to make advertising

claims for cars; but to make cars that will make good the claims is hard.

We ask automobile buyers to do this: After the advertisements have attracted your attention, then in fairness to yourselves and all the manufacturers, compare the cars point by point. That is all we ask.

There are Chalmers dealers in all parts of the United States—more than 200 of them. We suggest that you get in touch with the one nearest to you at once. Let us send you his name if you do not know him.

Chalmers "30" \$1500

Judged by price alone you might as well buy some other car as a Chalmers: \$1500 is simply \$1500—no more in one bank than in another, no more in bills than in coin, no more in your pocket than in another man's.

It is only when you begin trying to buy something with your money that the sense of value enters your mind.

Your \$1500 is worth more than another man's \$1500, if at all, only because you are able to buy more with yours than he can buy with his.

We believe that when you buy a Chalmers "30" your \$1500 becomes worth more than \$1500 invested in any other car. Careful investigation will convince you of this fact.

Please remember you are not buying a price or an advernuement: you are buying a car. Therefore examine the car on its merits.

If you investigate thoroughly a Chalmers will be your first choice, if you are able to get a delivery in your territory.

It is difficult to get more in a car, at any price, than you can get in a Chalmers "Forty" at \$2750. The "Forty" has all the power one can want, the quality to endure, beauty of line and luxurious finish. Seats for seven if desired. Catalogue "R" on request.



Chalmers Motor Company

Detroit, Mich., U. S. A.



Chalmers "30" Touring Car and Roadster, \$1500
Pony Tonneau, \$1800 Inside Drive Coupe, \$2100 Limousine, \$2750

OUR SEACOAST DEFRUGES.

(Continued from page 301)
not out of action, there are emerge pot out of action, there are emergency runse finders installed on the finals of cush battery. This range finder is the liter and Stroud b-foot, self-contained horizontal base type in case these are put out of action runges must be doter inlined by means of biosys or from observation of fire

firing of morters is far more dif-The Bring of Biogram is far more dis-ficult than that of gubs. The defici-ments at the mortans are completely con-cealed. These weapons attack the decks of ships, and when fired their location or snips, and when the tier to cannot be discovered. They are set for elevation in practically the same manner as gams, but their direction, instead of being set on sights, is accomplished by laying the morter on an azimuth circle isyling the mortar on an azimuth circle
to other words the mortar is set for an
elevation corresponding to the range,
and at an anate of direction equal to
the azimuth of a predicted position of
the terest corrected for wind drift,
travia to Many authorities conside
cred mortars in past years in bis so in
accurate as not to authorize their construction but within recent years the results of feels and the records of tay get practice have shown that mortars are of immenso value to seaconst forti-fications. Several companies in our coast artiflery have made as high as 30 per cut litts at ranges of six and seven thousand yards when firing on a mov-ling largel baving a speed of seven or right miles an hour and when firing but one morter at a time Mortnes have a particularly great value in repelling a reconnoissance in force as they can be lived with impunity without disclosing thoir location
Another important arm, if not the

most important arm of defense in the count artillery, is that of submarine minus. These weapons are designed to repel an altack when the bostle fleet the guns have been put out of action The system is so designed as io rende mines harmiest to friendly ships and to be under such perfect co the mine commander as to permit their being fired either by contact or judg ment The emitted principles involved in the control and fing of submarine mines is kept a secret. Ten years ago it took almost two weeks to plant a group of mines To-day, by the use of mine planters, a harbor ran be com ely blocked within twenty four hours

The work that will devolve upon coasartiflicry troops in time of war will be of the most trying and patience-racking

It is presumed in making this state ment that no fleet commander would attempt an open attack or "run by in broad daylight but would await the esrbroad daylight int would await the ear-ity dawn in a partial fog, when search-lights are useless and the spirit of the men at the guns at its lowest obb ile would, without doubt, wear the gunners and canoneers out and try their pail cince by making many sortles and feints during late hours of the night and car-ly morning before making his final atty northing occurs making its man ar-tack. He would also if possible await his attack until cold weather set in and snow had failen, knowing how dispir-iting ice and snow are to soldiers living in tents, as they would have to do during War

in the harbor of New York, for example. If war were declared all coast artillery would have to live in tents im-mediately in rear of the guns.

Would it not tend to haved discontent Would it not tend to hreed discontent and dissatisfaction among soldiery if they were required to answer "call to arms" every hour during the night for about two weeks in bitter winter

This is the work the coust artillery will have to do whan it is called to de-fend our country's ports from the invasion of a foreign unvy

It will be then that the 'brave the

(Concluded on page 307)

Wood-working



Engine and Foot Lathes MACHINE SHOP GUTFITS, TOOLS AND SUPPLIES SEST MATERIALS SEST WORK MARSHIP CATALOGUE FREE FEBASTIAN LATHE CO 120 Culvers St. Cincians

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supmobiles

The Happrochie dealer who also selfacone other as of the highest reputation and price, can, with perfect consistency, lift is the tools of hotil and any to you "Compare the two power plants or "Compare the two power plants or "Compare the two power plants or the ready of the process of the

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"It cost, in proportion, just as much to produce
"It enlisted the same high degree of enumeering skill.
"It engaged manufacturing methods g skill. aged manufacturing nethods

ial) as the leiders among cars of the merge-class.

The man who owns the two types—the Empuroble and the heavier, condifier exer-ing the condition of the condition of the Do you wonder that the Jiupmobile de-mand is so widespread and insistent that the facilities of the green new Empurobles plant are tasted to the utternoot? Lawing Detroit December 77, 1909—just after the Christman bilinard and ha ben-risat moreful of the winter- three lupusoidies negotiated the thousand nalles between Darrois and New York (ily by Jan 6, Oere every mile it was a lattle with the sow, and the termination of the trip—with every cut if and ready to have back at once for Detroit—marked the successful completion of the severest task ever imposed on a car of Lingmodies law and the severest task ever imposed on a car of Lingmodies law and the severest task ever imposed on a car of Lingmodies law and type.

HUPP MOTOR CAR COMPANY

OMPANY Dept. Q LICENSED UNDER SELDEN PATENT DETROIT, MICHIGAN

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HALLEY AND HIS COMET

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Schools, I while he beared history of Heley's Briston content is admired were comments on its participation of the
MUNN & CO., Inc., 361 Broadway, New York City

Local Notices

PATENTS

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MUNN & CO., 361 Breadway, New York

INDEX OF INVENTIONS

For which Letters Petent of the

United States were issued

for the Week Ending

March 29, 1910,

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The shape of the state of the s

rountine search in the control of th

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(Concluded from page 306.)

OUR CIVIL DAY. (Continued from page 202.)
particular day stays on the world (the entire world) for an exact hour
Let us trace the front end of the twen-

tieth century by this system of progress. We again show it as having reached its eighteenth hour on earth as in the former illustration. That is to say, it has reached the 90th meridian west of Green illustration. That is to say, it has reached the Sub-meridian west of Greenv wich, or central time, but as entirel reached the sub-meridian west of Greenv with or central time, but as entirely to FT/8 deg, west, making it arrive there had an hour too soon. We then compel it to stay there until it is a half hour monatain time, which lands the lat with the sub-meridian time, which lands the lat with the sub-meridian, and so on. By adhering strictly to the system, let us not what happens when January let reaches 150 deg. Of course it must cover the 15-deg, some, the onsite of which is 180 deg, thus transferring the "international data lime" to the thereby moved T% dee ahead of the 180-deg true line.

Before proceeding with our examination of the ragged date of time, which local convenience demands on the boar

tion of the ragged edge of time, which local convenience demands on the hour zones or way rations let us giance has the distribution of the time to the the three times of the time to the three times of the time to the three times of the times of times also appear in a constantly characing and more exaggorated form on the way sattions (hour zones) We have noticed how irregular the front end of the treation to minute years and the times also appear in a constantly characing and more exaggorated form on the way sattions (hour zones) We have noticed how irregular the front end of the treatioth control years when the tentered the earth Now refer to Figs. 5 and 4 and see what hap, vond to it when it local convenience demands on the hour and see what hap, ened to it when it progressed around the earth as far as progressed around the earth as far as New York city, that is to say when it reached 75 deg west (the eastern time zone) The dotted outline of the United The dutted authine of the United Balance anables not now the Pauli Beach. Morida, abould be "ringing in" the new year and contury in unitson with New York city Not so Pain Beach is still on the interested neutry cleandar, and will be for another hour The beach down to belong there, but as the railway managers voted it into central time in 1833, it is not "had there by steel rails just as rigidly as the Tomostonian year and the new year that the work of the property of the p

I once referred to these some lines to a I once referred to these some lines to a riema as imaginary "Imaginary" and he, "I will never forget the lime I passed over one when going to California from New York My appetite was running a bit ahead of time, and I was impatiently bit shoad of time, and I was impateently waiting for the dining car to open up at twelve noon, as the time table said it would. The porter entered my car, and instead of the musical sounds of first call instead of the musical sounds of first call for luncheon on a dining car he shouted "Bet your watches back one hour." It his train had reached El Paso, Tezza, under similar circumstances, it might have left the tracks. That is the point when the

have left the tracks. That is the point where the western time some overlags to make an extent that it actually meets an estarty defection from the Pacific some. The perfect would have then called, "Set pure variable sheet two boars." To present who have not looked closely into this complicated subject, the first question that conser to their lips its. Way the loop the fact lite said some likes straight in practice as well as to theory the proper that the property of the complex of

There must be a mighty solid basis for the phenomenal success that has followed the E-M-F Company from the very first.

No other Automobile Concern ever has enjoyed the tremendous success this one has. The whole world knows and all the world is talking about

the Company and its cars, constantly. There must be a reason and it must be a good one. Even competitors admit that!

Everywhere, E-M-F "30" is first choice of that class of buyers who want all that can be had of efficiency. power, durability and elegance and comfort at a price under \$2,000. (E-M-F "30" sells for \$1,250 fully equipped with five lamps, generator, horn and magneto.)

The farther you seek for the reason for this greater popularity-for the splendid reputation achieved by this car in so short a time the more does it appear that after all, the car itself is the real reason.

Ten thousand people are daily engaged in selling E-M-F
"30" cars—largest sales force and the cheapest-for they all work for love. They are satisfied owners.



The E-M-F Co., Manufacturer Detroit, Mich. LICENSED UNDER SELDEN PATENT

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(Concluded on page 308.)



Try Kerosene Engine 30 Days Free

Gasoline Prices Rising.









EARN WATCHMAKING

deg west of Greenvich passes right through your frost parior. You will therefore set your hall clock an hour for-ward and let your little mantal clock stay as it is now Very soon you would like to defect the line enough to at least pass cotaide of the walk. Then you see visions of a late delivery of milk for your breakfast, and request that the line sweep in the suit depot, then the rullway station, and finally that your of-fice be kept in the same son of priceder west of Greenwich p fice be kept in the same some of prictice. Take another glance at the eastern time some "That little bump on its even put there, and only to keep the line was put there, and only to keep the line and most of your neighbors were unaware of this deflection east of Maine is aware of this deflection east of Maine is a proof that the line benders did their work well if a very large percentage work and the second of the seco that their sone lines were bent, it would be time to bend them into some different

As some readers might overlock the fact that the astronomical day begins and ends at Greenwich at noon, 12 hours later ends at Greenwich at noon, 12 hours later than the beginning and ending of the civil or common day (the day we sleep and eat and work by), we should make it plain that all the illustrations and reit pain that all the iterations and re-marks apply to the civil one. The astro-nomical day is a clean cut straight line affair that needs no adjusting to prac-tice. The users of this kind of a day do not try to thrust its date line aside. The not try to thrust its date line saide The observatory at Greenwich was built right on this line and to make it more realistic a bronse tablet is set in stone with prime meridian (Zero Degree) engraved on it so that it may be seen and feit by those who visit the observatory

The Energy of a Collect Spring

The old question of what becomes of the energy of a coiled spring placed in suiphuric acid cropped up again before supparts and cropped up again before the Western Society of Engineers during a discussion on the conservation of en ergy Dr Steinmetz gave this explana-tion on that occasion

tion on that occasion

The heat produced by the chemical
action in a coffed spring when dissected
is greater by the amount of energy
actored in it than if the spring were not
under pressure. The amount of energy unner pressure The amount of energy which is stored in compressing the spring in best measure is so insignificant compared with the energy of solution that one cannot measure the difference calorimetrically but one can prove that the compressed spring propers that the compressed spring proove that the compressed spring process a greater heat in dissolving than duces a greaker heat in dissolving than the ancompressed spring, in an indirect manner The measure of the chemical energy is the electrical potential differ-ence if one dissolves from in an acid and the from in nader strain partly com pressed, partly not one finds an unequal corrosion due to local current between the different parts of the iron. If there is a local current it means that the difis a local current it means that the dif-ferent parts of iron have different poten-tial differences against the electrolyta-that is different chemical elimities, and the part under strain is dissolved first, showing a greater potential difference and thus a greater potential difference and thus a greater potential difference solution. Thus, if only a part of the spring were compressed, the other part inch, the compressed part would finactive not, tas compressed part would dissorted first in the sulphuric acid by the local current circulating between the two, showing that its solution gives more en-ergy than that of the uncompressed part.

Thomas Misson resently took out a patent on an improvement in his storage battery According to the patent the active material for alkaline storage batteries is impregnated with an exygen comment in a notation of a bismuch sull, then subjecting the material to centrings action, and afterward drying The orientees and the control mass in a solution of a bismuch sull, orientees and a first orientees and a first orientees are all the subjection, and afterward drying The orientees are all all solution, and stanty washed to remove the smooth of alkali.



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SPEED INDICATION

The name Werner has for years stood for aboracy in practically every lice where the determined is a factor.

seed is a factor.

The Warner Herograph, an electrically-operated race of device, regaters bandrothis of a second, it is so far from to any other that it was adopted at once by the onal Racing Association.

And the Warner Auto-Metre bears among motionist protect side of "The Aristocrat of Speed Indicators."

In fact, the sole slogen of competitions may be said to be, "It's cheeper than the-Meter."

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pense whatever is spared in its construction. is. It is built with the same care and thorou

Yet the demand for the Warner Auto-Meter has increased so rapidly that to that been quadrupled within two years. And our factory is the best equippe and in the world.

and in the works.

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The Overland The King of Cars

It requires four factories, employing 4,000 mem—tambing out 140 Overlands duly—to meet the flood-like demand for these cars. Yet two years ago abundend irrails had a larger stage. The reason lies largely in the cars made it almost trouble-proof acceptance of the control of th

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He designed the pedal control
oes forward or backward, slow
sit, by merely pushing jedals
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The Overland always keeps going, and almost cares for itself. All the usual complexities have been climinated.

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Its Manufacture and Uses By JOHN K. BRACHVOGEL, M.R.

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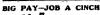
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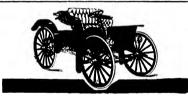
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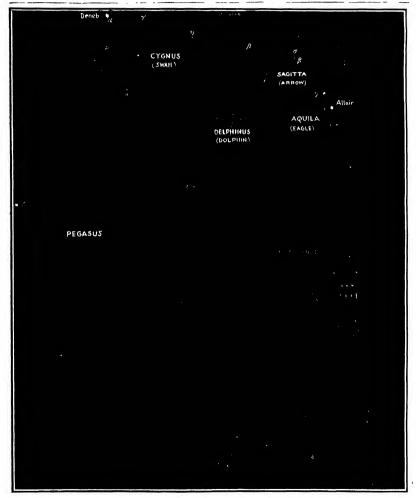






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NAN YORK SATURDAY APRIL 16th 1910

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THE WORLD'S FAIR OF THE FUTURE

all probability the city of San Francisco will lead an international exposition, or us it is more pagularly known at World's Fair to celebrate the opening of the Panama Canal in 1915 If the promoters of the fair are willing to prafit lessons of former expositions their efforts will be directed to making the coming fair notable not for mere bulk and arm but for its compariness and the gruning excellence of its carefully selected exhib the grantine excellence of the carefully selected exhibits. The trouble with many pre-time spacetions has been that they were big to the point of being wearl some and oppositions has almost in this direct tion was rewrited at the St. Louis Fair in one single imilding of which is taken and to the state of the sale of the state of if he wished mertly to waik past inc whole of the exhibits Wintever may be the interfor motive, the avowed object of these exhibitions is identicual. Therefore, they should contain only the most dis linetise and valuable results of the world a sciutific indostrial socialistical and constructive work And in this connection we would ask whether it almost an insult to the good tasks and intelligence of the millions that are solitized to enter such as exposition if a large section of its space is devoted to that cheap form of entertainment which was inaugurated by the notorious Midway Plaisance at the Chicago Exposition San Francisco will have a great opportunity by breaking away from certain false traditions to render this, the latest of the ex-positions something fatter than a mere plaything of the real-catate dealer the side show man, and the poli-

OYROSCOPIC EFFECT OF REVOLVING ARROPLANE MOTORS.

titure were certain conditions in the r fatal accident to Le Bloss which engaged that the gyroscopic effect of the motor may have contributed to the disaster. He was maing contributed to the diseaser. He was using a light immonlymn of the literfect tree driven by a finance resulting motor. The seroplane, although as more until the standard and its good working order beams unmanageable and turning counted to your, fell to personal context running as 4,000 revolutions per min until motor running as 4,000 revolutions per min ur, must have been considerable. A sudden turning of the seroplane in the right or left by the aviator counter of the context of t would produce a strong poward or downward gyro would produce a strong upward or downward ayro-scopic Highing tendency in the longitudinal direction if this tendency were aggravated by a gust of wind it is conceivable that the action would be unable to control the although mufficiently to prevent a complete upset. At the time of his fail i.e. illon was fly ing above the bay at San Sebasian Spain, in a high, gusty wind is it not possible that the joint action wind and the gyroscopic effect of the engir and propeller was responsible for the disaster? and propeller was responsible for the disaster? The tragic death of Is lagrange when he was using a monoplane equipped with the same type of motor suggests that his sudden upset may have been due, in some measure to similar scusses.

ARRESTS IN OUR OWN AND THE BRITISH NAVY I are frequently asked by correspond to give some comparative figures show ing the relative excellence of the shoot ing in our own and other navies. We would gladly do so, but it is a fact that there is no information regarding the makes of the world more difficult to obtain than this France and Germany, in partitular never giving to the world the, results of target practice Both the United States and Great Britain however, do publish such figures. But even here it is often difficult to establish accurate comp dom complete, either the range or the aise of the target being frequently omitted, and no statement heing made as to whether larget or ship or both were moving However, we offer the following compari-

ou, which is based upon official figures.

The Engineer of London states that the results for the past year have shown that each 12 inch and 10inch gun has averaged 063 hit, each 92-inch gun, inch gun has averaged 053 htt, sach 3 3-linch gun, 134 htts, and each 15 link gun 247 hits, these being the average number of hits per gun per minute for the whole navy The 6 linh 47 linch, and 4 linch guns varied from slightly over 4 hits per minute for the 6 linh 10 5 hits per minute for the 6 linh 10 5 hits per minute for the 1 linch 10 5 hits per minute for the 4 linch By the courtiesy of Rear Admiral Mason, Chief of By the courtiesy of Rear Admiral Mason, Chief of

the Bureau of Ordnance we are enabled to publish the average results obtained on all the guns on all the ships taking part in target practice in the United States navy Whether the ranges and the size of the largets corresponded to those in the British navy, we are unable to say The results are, for the 12 luch gues 972 bit per gue per minute, for the 10-inch, 1176, for the 2-inch, 183 and for the 7 inch, 313 bits per gue per minuto, whik the results obtained with same as were obtained in the British navy Ono 7inch gun holds the remarkable record of 10 26 hits per minute, while the highest score with the 12 inch per minute, which the nignest score with the 12 inch gun firing when the ship was under way in smooth water, was 4 hits per gun per minute obtained on the l'aited States ship "Obio"

CERTAIN ADVANTAGES OF LIGHTD PURL

O judge from a succession of articles which and certainly the most noisy of the London and certainty he used noisy of the fonders daily papers on the use of liquid first in the British navy, one would suppose that the virtues of this fuel had only revently been discovered and the the Admiralty had determined to abolish its coal degots and turn the hunker rooms of its warships into oil tanks. As a matter of fact any such sweeping subsilintion of oil fuel for coal is not now contemplated nor ever will be either in the British or any other 110 VV The natural sources of oil supply are not suffi clent in capacity nor are they so which abstributed as to make it possible eliber for the merchant marine or the natios of the world to make a wholesale sub-stitution of all for coal. Some countries notably the I nited States and Russia possess such abundant sup-plies that they could, if they so wished, make a much more complete use of all, and, because of this adventage it is not unlikely that our nevy at least will nitimetely make a more extensive use of oil fuel than the navy of any other pownr

The advantages of all over coal are so many that were there as much oil in sight as coal the new fuel would in vitebly supersede the old altogether. In the first place, the higher evaporative value of liquid fuel not only enables a larger quantity of fuel to be carried in the same space but its mac randers possible a derrease of 75 per cent in the number of stokers or fire toom witendants. Being in the liquid form it or fire soom altendants. Wring in the liquid form it can be imploved as halland and pumped that be remote quarters of the ship far runwed from the hollier room and insects subfile for the landling and transportation of coal. For the merchant ship this means not only a saving in the fuel and sharp lift, but a possible representation of coal for the merchant ship this means not only a saving in the fuel and sharp lift, but a possible representation for a similar reduction of response and what to fire greater, value, a considerable extension of the cruising radius or the distance over which the ship ran trevel without replonishing her fuel supply. For the merchant ship there is the further advantage that the bunkers can be filled by a pipe line without the or may, airt and underser writen accompany too pres-ent coaling operations, while for the warship there is the strategic advantage that the ship can take on fuel by a pipe line from a tank ship at any place and in any but heavy weather Furthermore, the use of oil enables a whole freet to steam without amitting those tell tale clouds of smoke which are one of the surest means of betraying its presence to the enemy

ANCIENT AND MODERN TRANSACTION

ATRONG sentimental interest will be aroused by the aunouncement that the great irriga-tion works, which at the very dawn of histion works, which at the very dawn of his lor veredored the land of Mesoponamia agarden of fertility, are now being researed on a setuinstive scale under the sames anothers who was responsible for the very successful irrigation works in the valley of the NIN. Our tilluded filtare Commit at Bagada, Turkey, speaking of the importance of these works says that if the plan should succeed of the works says that if the plan should succeed only part. If promises to reveittenine commerce and shift irade balances and traffic in that part of the world. A total of 13 500,000 acress of hand is to be reclaimed at an estimated cost of \$18 per acre, and so fortile is the land when properly brigated, that its estimated value, according to the Terkish government, will \$85 per acre, the soil being capable of yielding large crops of wheat, barley, and cottan. We spoke of sentiment entering into the interest with which we regard this work, and there is con-

tainly something that appeals strongly to the imagi-nation in the fact that both in ancient Expet and in nation in the fact that both in ancient Egypt and in were more anosint Mesopotamia, the Angi-Gazon, after a lapse of four or five thousand years, should be repeating on a larger seals and with the greater akill rendered possible by modern appliances those feats of irrigation which are one of the chief giories of the ancient, but never-to-be-forgotten, races that once foursisted in the valleys of the Nile and the Euphrusse. Wilatever may be the future fait of the great As-

gio-Baxon race, the vast works of irrigation which it has carried out in India and in Egypt and is pow acc twity prosecuting in Mesopotamia, must ever stand out as one of the brightest evidences of its civiling and uplifting activity

and uplifting activity
During the recent progress of President Room-rolt
down the velley of the Nile, his visit to the great
reservoir at Assonan and the sight of the marvelous
ferrillity with which it has enriched the valley
blow, must have carried his thought to those even
greater works of irrigation which are now being
preserved in the arid region of our Western States; works which owe their inception largely to his own tireless energy and enthusiasm. Here also the latest and most powerful branch of the great Anglo-Saxon rare, in the space of a few years, has completed the initial work for a project which promises to bring thirty million acres of unproductive land under the richest cultivation. And in this connection it is limely to draw attention to the great ability with which the Reclamation Service has done and is now carrying on its work. A well-deserved tribute to the engineers in charge was recently made by Senator entiners in charge was recently made by Senator Newland of Newland and Newland with rare speed,

The work siready accomplished consists in the provision of dams headworks, etc. and the \$30,000. water so stored, by the construction of canals for dis-tributing the supply upon the millions of acres which only await lis arrival to spring into instant fertility

TESTS OF TUROSTEN LAWFS

a buildin recently issued by the University of results of an important study of various types of tungsten and imandescent lamps a study which should prove of considerable interest in growing importance of metallic figment illumination The conclusions of their investigation may be thus

Comparisons of the durability of fliaments made by Comparisons of the cursourty or manners mave by the colloid, deposition, and pasts processes are very difficult to make because the three types are usually mounted differently Undoubtedly the manner of mounting the filament has a great effect upon its like, and whether the superior life of one type lamp is due to the fact that it has a better scheme of mounting or to the fact that the process of manufacturing is bet-ter, can hardly be decided definitely from these tests. ter, can hardly be decided dennicity from these begs. Tests of filaments made by the three processes and mounted in exactly the same way would be necessary to decide the question definitely From the tests de-scribed, however, the colloid process seems to give a filament that is less durable than the other two. The diament that is less durable than the other two. The class show that performances of tungates lamps vary to a surprising degree, depending upon the kind of lamps used and upon the conditions under which thay are burned. Some lamps will give as high an operating cost as the old carbon lamps while burning under certain conditions, whereas other jumps will give good entered the conditions, whereas other jumps will give any other conditions, whereas other jumps will give any other conditions. Under the best consistent give acceptance of the first performance of the first state of the condition of t ed in a remarkable way and the life is very long, often several times what the advertised life is. Breakages in shipment and handling have been reduced to a small fraction of what was formerly comduced to a small fraction of what was formerly com-mon Of, three hundred lamps purchased for the tests by the experimenters, only three were received with broken filaments; and although the lamps in some of the tests were handled doesn of these, almost no trouble was experienced so far as the breakage of file-ments was concerned.

Scientific American

ENGINEERING.

The Minister of Public Works of Panama will shortly sak for bids for the construction of a railroad from Panama to David, a distance of 300 miles. Bids will be saked also for lines from David to Booss del Tore, and from Panama to Los Santos.

The Mary Department recommends an appropriation of \$10,000 for prises, etc., to be awarded ships in commission for general efficiency and economy in coal consumption it is estimated by the Department that competitions of this character have resulted, and will continue to result, in a saving of ten per cent in coal consumption.

In spite of the steady increase in passenger travel in this city, the opening of the new East River bridges to beginning to tell heavily upon the traffic over the East River ferries. The Union Ferry Company of Brooklyn has been oblighed to discharge three boat craws, and change the schedulo on three different lines from a 10-minute to a 50-minute headway.

Acting on the recommendation of the Public Service Commission, the interborously Company of the city will install care with destination signs on the elevated line, which will automatically tell the elevated line, which will automatically tell the control of the station the train is approaching. The great convaniance of this arrangement to the travel public will be out of all proportion to the small cost of nutting it in place.

The British Hay on the Interest year call prices are called the for five battlets plug of the dwandought type, five for five battlets of 25 knots or over, twelty destroyars, to tested cruiers of 25 knots or over, twelty destroyars, to tested cruiers of 25 knots or over, twelty destroyars, the tested of 25 knots or over, twelty destroyars, the clinding the ship's to be laid down this year, the dread-ship to be laid down this year, the dread-ship to be laid down this year, the dread-ship powers are for over 15 knots of the 15 knots of 15 knot

speaking on the antigest of defective open-based rails, at the last atnual convention of the American Society for Testing Materials Robert Joh amphasias the frest that the more term 'open hearth is in itself no guarantee that the rails made under that system will give good service, since they are subject to the same general defects of manufacture as Bossemer rails, and sheece require squal care during rolling ele-

The Pennsylvania Radiread recently run its first plantan train from Harrison, N J, by way of its new tunnel system to Long island and return it will be three of rour months, however, before the whole system is thrown open for public service. The trained to Long island, noises the plant of the company miscarry will be sphilled spensed on the 18th of July. The about the 18th of July.

The Army Board is making some important capacity means to destroin the resisting power of a solid mass of concrete, as compared with armor plate in a recent test with a 15-inch gun, a shot was fived which poneirated the concrete for a distance of 21 feet, which sequirable to the pincing of a 15-inch armor plate. The target in now being reconstructed for tests with concrete the contract of the co

The Director of the Royal Dockyard at Castellamars, likly, has produced, if the reports are to be believed, a torpade beat without funnels. By means of eletrical ventilators the products of comburtion are disclarated from the vessel without the assistance of smokestacks. The first experiments, on a trip from Castellamare to Naples, are said to have been at trendly successful, no smoke being shown and the vessel guitting up steam with great rapidity

The shories or surplusage of freight cars is one of the reliable indications of husiness aritrity, if not beliable indications of husiness aritrity, if not beliable stretched in the first stretched in the stretched in th

The Madeos and Manhatan Rallroad Company has built too saled cars which are specially designed for transporting baggage between the steam railway term lasts, which are served by the Flotten River tunnist, with a view to evoiding etter handling and trucking, each are is arranged to receive eight loaded baggage ranch, which are loaded and uncloade between plattown and car over Rolling steel plate aproas, which form part of the garmaneous tatchments of the ext.

we copportuneent attachments of the car.

The Inthinate Casal Commission has colled for the
manufacture, delivery, and evection of about 16,000
tons of steel parts, which will be used in the constraint of the foreign of the foreign color, asked of the parts uniterally lock gates of two lawses
makes ever built. They are all about 55 feet wide, and
apply from 47 feet 4 bendes to 81 not in beight due
dies player than of these of the color of the color of the
first of the color of the color of the color of the
first of the color of the color of the
special States.

ELECTRICITY

At Exercity universe telegraph club has been formed with a view to audying wireless telegraphy, and one of the special objects is to discover some method of overcoming smateur inter-

Some time ago the United States Steel Corporation installed two Heroult furnaces, one at Wort-ester Mass, and the other at South Chicago These for macre have been in commant service ever since, doing twelve beaus per day it requires between an hour and an nour and a half to reflow a merite ton of seed and 150 kilowatt hours are consumed to describe the control of the control of the control of the control of the Chicago and the Chicago and the control of the control o

A test of the telephone service in Wiknosate was recently made by a complishion. The investigation was carried on servedly, so as to determine the actual conditions of service. It was found that the average time between a call and a response was 478 seconds The quickest average response came in 137 seconds and the slowest in 73 seconds and the services which must quickly responded to a call were found which must quickly responded to a call were found to the properties of the provided a page of the service offered by the exchanges

It is remarkable that while within suberrably has made rapid strides very important considerables have been almost entirely neglected. Much attention has been paid to attenement and selectivity and also to the radioness of the suberrable within the development of the attenues has been site of all the revelopment of the attenues has been site of all the revelopment of the attenues has been site of the the revelopment of the attenues has been suberrable within the suberrable within

A staphene sable loaded with Pupin rolls was taid in Lake Constance in 1986. This was a lead-order chief and it was very difficult to by it on account of the late of
A secise of tests has recently been made to determine the strength of the metallic filamouts of lamps and their resistance to sheet. The lamps wore tested by bleeting the lamb of lam

Sectionation of white wine is the object of a paper presented to the Academio des Sciences by Messra. Mauralia and Warcollier Previously they studied the action of ultra-violet rays from a quarta mercury super lamp upon cider in ferometation. With this will be also appeared to the control of the previously they are also act upon eitherent thicknesses of layer so a condestroy the feromeating principle and thus prevent any new feromentation. Unling layers of vine of kg millimeter (old linch) held between a 02 linch quarts plate and a giase plate and organed to the hamp so the plate and a giase plate and organed to the hamp so the plate and a giase plate and organed to the hamp so the plate and a giase plate and organed to the hamp so pourse below 8 seconds. With 17 millimeters (0.07 linch) exposed at the same distance from that lamp formentation was always sloped after an appeare of over 1 minute and over in less than 30 seconds. It is to be noted that in control of the control of layer, and that the sherilisting of white where can be more easily carried out than that of cider, the being so doubt as the control out that that the control out that that of cider, the being so doubt as the control out that that of cider, the being so doubt as the control out that that of cider, the being so doubt as the control out that that of cider, the being not out the second out the control out the

SCIENCE.

Prof. Ellipsychisty tablet, said to sphold the Biblioth secons of the Dulays, we discussed at a mestigal cancentrate of the Dulays, we discussed at a mestigal of the American Oriental Society at the Johns Hopkins University, Prof. G. A. Barton of Bryn Mawr College, Prof. Paul Haupt of Johns Hopkins University, and Prof. Albert T. Clay of Vale University, and Prof. Albert T. Clay of Vale University, thought professional to the Control of
The pertunes and flavor of vanilia are due to a substance salled vanilin, which also occurs as an Ingresil the salled vanilin, which also occurs as an Ingresil the salled vaniling which also occurs as a fine salled vaniling the salled vaniling possible by substituting feer. The same identifies the salled vaniling possible by substituting suggeout for conferin. The price of vanilith has fallen from \$770 per pound in 1876 to \$4 per pound in 1806 A further reduction is acreedy possible because of the high price of suggeout flavor of vanilin the general methods of synthesis of aromatic galebydes, which are deep rided in a revent number of the Bulletin do is \$400.000 for the preparation of vaniling the great price of the salleting are deep rided in a revent number of the Bulletin do is \$400.000 for the preparation of the Bulletin do is \$400.000 for the salletin do in \$400.000 for the salletin do is \$400.000 for the salletin do in \$400.000 for the salletin do is \$400.000 for the salletin do in \$400.000 for the salletin do is \$400.000 for the salletin do in \$400.000 for the salletin

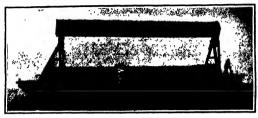
The price of pure Para India rubbr, which in 190 was 88 cents per pound, row inst year to 12 be pound. This increase in price gives additional inferests to the processes of regeneration of waste rubber and of the manufacture of substitutes. The regeneration of valuesanted india rubber consists in removings the sulphur, which was added in the process of valuesanted into The serap rubbr is assorted an ording in quality, and is resulted with sulphur and order with sulphur, which was added to the process of valuesanted of the sulphur. The material is thou ground and washed. This regenerated India rubbr is used only as an addition in small proportions to now rubber. Artificial or intiation rubbe is made by in those which resemble the process of valueshing natural india rubber, for example, by treading linesed oil with sulphur or sulphur

One of the most Interesting results of the Smithsenhan Artisan Expelition has just been published by Mr. Girril is Miller Jr. curator of the Division of Manninks U. S. Sational Museum under the little of Doverlation or a New Species of Hippopolasus. There have been for some years in the colicitous of Shich was from the Zemileol litter. East Africa and the other from Angols Week Africa. These shulls differed susterially in several details of form child produced instartially in several details of form child moverer in the constricted shape of the rostum but the characters were not dermed of sufficient value to justify the creation of a new species for the different points of the control of the several details of the control of the several details of the different value to confident of the several details of the different value to the several details of the severa

The gas begs of modern balloons are made of a cot on fabric control with India rubber in the most careful manner, in order to sesure perfect impermentity without surficing lightness. For all large balloons, and especially for dirigibles two layers of citoh are susperposed and enemated togs there. The outer skin is covered with India rubber on one side only hat leads to the lange and the lange and the large and the depth of the large and
THE "VIEING"-SELF-DUMPING DECK SOOW.

A novel system of self-dumping seow capecially designed for the discharge of rock and solid debris bas signed for the discnarge of rice and some action of the born devined by Mr. A. F. Viking sustince and ship-builder of Stockholm. At this port the committed dumping of such material into the water is of part tholar interest hassmuch as the blasting of rock in

contilbrium of the latter is upset merely by & equilibrium of the latter is upper mercey or formules water through the agency of compressed air into the elevated tank, which causes the scow to till over and shoot its lead Bhould the flush deck be fitted with the white arks, these are fashioned in the form of bot tom hinged doors on the discharging side, so that they wn as the barge heels over, and permit the load



After damping, the seew returns to an even keel.

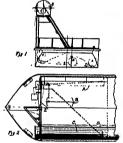
connection with the extensions to the harbor or the streets of the city is in continuous progress Several designs for automatic dumping have been evolved but the Viking" system so called after its designer, has been the first to be submitted to practical test and has proved remarkably successful. Through the courtesy proved remarkably successful. Through the courtesy of the inventor we are enabled to illustrate and de-scribe this new barge, it differs in its action from any

in the hold of the seew on the side opposite the elevated cylindrical tank is carried another tubular tank A about haif the length of the former. This is filled with water, and in the case of the scow illustrated holds about six tons for a load of 200 tons on trated holds about six tons for a load or zow one or the deek. Alongside this water tank is a small cylin dri ni vessel B containing compressed air the pressure being approximately seven atmospheres. On the same side as the elevated tank in the hold below, is a third cylinder C also about half the longth of the clevated compressed-air vessel is also connected to this valve box, but is shut off from the same until ready for dumping. The third vessel below the elevated cylinder, as siready mentioned, is always open to the free atm as already mentioned, is always open to the free hims-sphere through a pips, but there is a second pipe and valve provided in connection with the main communi-cating pipe between the first water tank and the ele-vated crimder. It will thus be seen that there is valed cylinder it will thus be seen that there is always open communication between the first water tank and the elevated cylinder by means of a main pipe which is carried up alongside the vertical leg of the tripod at one end In addition there is a smaller the tripod at one end In addition there is a smaller air pipe running up one of the triangular legs and passing right into the body of the tank, having its outlet near the top of the cylinder inside. This pipe is in connection with the outer atmosphere, so that nor-

in connection with the outer atmosphere, so that nor-mally the upper yeasel fail till of air.

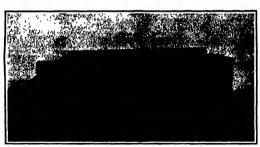
The load is stowed on deck in the manner abown in the illustration. When rock is handed, bulwarks on three sides only are necessary, the fourth side from which dumping is effected, below the elevated man, being ist quite open or at the most having only a low ridge. It soft material is carried, hinged doors, as already described, may be used, those automatically opening under the pressure from the food on deck when failing flat and clear so as not to obstruct the shock When the loaded bargs has been towed to the dumping site, a cord is putted connecting the mechanism of the scow with the tug. This opens a vairs, wich

ing sits, a cord is putted connecting the mechanism or the scow with the tug This opens a valve, which permits the compressed air to flow to the valve box, and also a slide valve in the latter, whereby the com-pressed air is admitted into the lower water vessel A. The pressure exerted forces the water from the lower tank into the elevated cylinder D, the displaced air is the the development of the control of the contro



A, B, C D are ballest tanks by the emptying and filling of which the second dumped and righted Fud elevation and half-deck plan of scow.

other vessels of this class in service inasu stead of the coutents being dumped through self-open ing doors in the bottom of the hull the se over on lis beam ends by a very simple action. The load is carried on a flish deck or the fatter is fitted with low butwarks. On one side, extending the full length of the seew is an elevated cylindrical tank D, mounted about 16 feet above the level of the sleek on two tripods. When it is desired to dump the barge, the

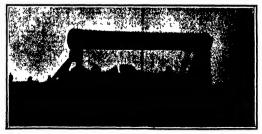


The scow titted and load sliding into the water

cylinder which at first is empty, but which is always

open to the outer stmosphere through a small pipe. The water vessel A in the body of the pontoon is in open communication by means of a pipe E with the elevated tank, and the former is also in connection by another pipe with a valve box pisced at the foot of the tripod carrying the upper tank. When the valve in this box is in its initial position, this second com-municating pipe is open to the free atmosphere. The valve box is returned to its normal position, cutting off the supply of compressed air to the lower water tank, and at the same time opening the latter to the

free air
The load may slip off the deck at varying inclinations, this factor depending on the friction between the load and the deck and the character of the débris II he slipping takes place early, at a low deck incitionation, the upper cylinder may never reach the water, for the scow rights itself immediately the load all dicharged. Should such result, the water forced into the elevated tank returns to the lower water tank dipsetly the compressed-air supply to the latter is cut off by the second poil of the cord controlling the mechanism. It may happen, however, that the scow heads right own. It is the second poil of the conference on which at once oness the communication. it back to the spright position a third pull is given to the contrict lops, which at once opens the communica-tion between the upper tank D and the water ressel O placed immediately below it in the hold. As this latter tank is always placed in a position lower than the cleavated cylloder, the water must flow by gravitation into it. When a sufficient questity of water has passed from the upper to the lower cylinder, the harps rights itself, and the water remaining in the elevated tank as well as that in the tank immediately below, returns as well as that in the tank immediately below, returns as well as that in the tank immediately below, returns to the main water cylinder on the opposite side of the vessel in the held, by gravitation. This accomplished, a fourth puil on the control cord returns all parts to their original positions. The compressed air is the into its vessel by means of a hose complet on a return in the top of the air chest, and when sufficiently charged the valve is closed and the hose removes. When the barge is to mis springly position, all values? We



Lended and ready for dumning. THE "VIETE "-A SELECTIVE MADE 1904.

Scientific American

the elevated that, or the one immediately below it, must return to the first tank on the opposite side of the barge, as the latter is placed at the lowest point, the return being purely gravitational it will also been that the water circulating between the tanks cannot escape. Giverine is mired with the water to revenity revening it could weather, so that the system revenit freezing in could weather, so that the system can be used any time of the year irrespective of cli-

The scow shown in the accompanying illustrations is in daily service at Stockholm, and has proved emisently satisfactory to the engineers of the city. The results that have been obtained prove that this self The dumping barge is superior to the ordinary hopper type with false bottoms. It is cheaper in first cost and maintenance, can handle rock of practically any size and weight within its total capacity, and is a first class cruft for any harbor transport. If desired, the calm craft for any harbor transport. If desired, the elevated cylinder can be unshipped in a couple of hours and the barge used as an ordinary lighter. The system is applicable to any type of barge whether of the blunt-ended type or one of fine lines. It is only necessary to insure a sufficient breadth to counteract the influence from high winds. The success of the flush-deck type has induced the inventor to extend the idea to craft with sunken holds for bandling gravel, mud, and other semi flouid or soft material, which canot be accommodated on a flush deck.

WALLEY'S COWET AT ITS BRIGHTEST

BY REMET ROBERS RUSSELL, TR D., PROPERTY

It may have seemed remarkable to many people that so long a time bas clapsed since the first observation of Halley's comet at its present return, and yet it has not shown itself at all to ordinary eyes. The accom not snown town; at all to orthusty eyes, the account panying illustration (Fig 1) will help to explain this. When first detected has September with very powerful telescopic aid it was far beyond the limits of our diagram, at twice the distance of Mars from the sun, and nearly as remote from the earth. At first the two



Fig 4 Spectrum of Hatley's comet

raphed at the Yorkes Observatory by Prof. Frost, January Lith The spectrum of the counct le in the middle between the two ghiest star-spectra. Nee description in test. The blue end of the spectrum is on the right, the situ-violed on the left.

bodies approached each other rapidly, but before the end of the year our planet crossed the line joining the comet with the sun, and by January 1st, as the figure shows, we were moving simost straight away from it shows, we were moving amous straight away from it.

During the early part of the year the earth and comet
passed on opposite sides of the sun, so that it was
lost to our view early in March
About the time that this is printed it will come into

About the time that this is printed it will rome into agict again, on the other side of the aur rising before daybreak. But now its path has corred so that it is coming toward use—dimed interctly, if we take it or motion into account as well as its own it therefore seems to stand atmost still among the stars, while growing steadily larger and brighter, so that any one might cell by its mere changes in appearance that it was approaching us rapidly
Finally, about the middle of May the comet

apparently approach the sun again, and on the 18th It will pass in front of him, literally between us and the aun, transiting the latter's disk If at this time its is more than fifteen million miles in length we will name through it, as the figure shows."

The cetnet's closest approach to us comes two days later, on May 20th, when it is but fourteen milition miles away For a few days following this it will be didly visible in the evaning sky, and then it will fade gradually as it recedes from us.

rate gradually as it recedes from us.

It is clear from the diagram that this apparition of
the comet is an exceptionally favorable one, for it
passes the earth almost at the point where their orbits
come nearest to one another if it had returned only three weeks earlier, it would have come as near as nearths possible—only seven millions of miles—but at this time it would have been directly south of the earth, astro * Prof. Barnard has informed as that the tall was 14,000,0 hag on Polymary Sith, from which it may well be informed t

nomically speaking, almost over our south pole, and quite invisible from northern latitudes. It therefore appears that the present conditions are simost ideally favorable for observers placed as we are, north of the

The illustration on the first page above better than any vorbal description where to look for the comet in the morning sky in New York The moon and Venus



Fig 1 -- RELATIVE POSITIONS OF HALLEY'S COMET, THE RARTH, AND THE SUR

are shown in the positions which they will occupy about May 1st, when, on the whole, the comet can be seen to the best advantage At an earlier date, Venus seen to the best avantage. At an earlier date, venue was higher in the sky, compared with the comet. There was less trouble then from moonlight, but the comet did not rise so early—about 4 A M on April 15th as against 3 A M, on the later date

against 3 A M, on the later until The comet's brightness when it appears in the even

Observatory show the appearance and character of the comet earlier in its apparition. Fig. 2 lilustrates its extreme faintness at the time of its rediscovery (which was announced by Prof Woif of Held there less than a work before the earliest of the four photoless than a wook before the earliest of the four indo-graphs here shown was taken) while it was still 400 million miles distant, both from the earth and from the sun. On any one plate it is difficult, if not im-possible to distinguish the comet from the multitude of faint stars around it, but on comparing the four (which show exactly the same region of the sky) it

twhich show exactly the samo region of the sky) it is easy to see that the stars are the same in all, while the comot is 'here to-day and gone to-morrow". With the great Yerkes telescope (which gives far smaller and sharper images of the stars than can be reproduced on any known photographic plate) the comet was evon at this time quite different from the darks in apparamace, in Prof. Baranard's words, "a fleck light sorrounded by a faint nebulosity" with no



egraphs taken by Mr Lee with the two-foot reflector of the bearratory. These four photographs represent the same af the sky. The errows point to the count which appears. His a finish size but moves from night to night.

definite boundary His measures, made on several nights, show that its actual diameter was about 12,500

Our second illustration, from a photograph taken when the comet was 143 million miles from the sun, and 163 million from us, shows it already well ad vanced in the changes which invariably accompany the approach of any considerable comet to its perthelion.

The head of the comet has become larger—not merely in apparent size, owing to its approach to os but actually in miles, while a faint slender tail, pointed

way from the sun, makes its appearance
As Fig. 1 shows, the tail, which extends directly away from the sun, was at this time also nearly in line behind the head as seen from the earth so that its actual length must have been much greater than -about five million miles, according to Prof Barnard

This considerable development of the tail, while the et was still at two and one-half times its least distance from the sun, makes it probable that at and after the perihellon passage, on April 20th it will be much longer, probably long enough to envelop the earth as it sweeps past.

Our third illustration shows the spectrum of the comet photographed on January 14th, when it was short 170 millon miles from the sun

In taking such a photograph, a prism is placed in front of the camera. The light of a star is thus drawn out into a line which, by jetting it trail on the plate is hroadened into a band, crossed by the dark lines which tell us what absorbing gases exist in the star's atmos-phere Most of the objects on the plate are the spectra of stars near the comet obtained in this way spectra of stars near the comet obtained in this way The comet's spectrum is near the middle between the which were produced by supplementary exposures of some bright star, and serve as reference marks to find the position of the lines in the spectrum of the comet itself. The inter unlike that of the stars consists



Fig. 8.-Halley's comet on February Sci. 1910.

From a photograph taken at the Yerkus Observatory by Frof B
As the instrument was kept pointed at the coned during the cap
the stars appear as short streaks. The actual length of it
comes a tall is about fire million mile.

mainly of bright bands or flues three of which are conspicuous. The brightest of these as is shown by comparison with the hydrogen lines of the comp spectrum is the so-called cyanogen band at the ex-treme violet end of the visual spectrum. The others are probably as in the case of other comets, also due unds of carbo

to gaseous compounts or carbon.

Between these bright bands can be seen a faint continuous spectrum, due to reflected sunlight.

When the comet first appeared the photographs made at the Lik Observatory showed this continuous spectrum alone. At that time it must have been shining cutirely by reflected light, but by the date of our lilistration it had already begun to be self lumi nous. This is corroborated by the fact that its hright creased much more rapidly than could be ex ness increased much more rapidly than could be ex-plained by the mere increase in the amount of reflected light, due to its approach to the sun and to us. This intrinsic light of the comet, as its spectrum shows, is given off by iuminous gas, but we do not

yet know what makes this gas shine. It can hardly be high temperature, for the comet had just come from the depths of interplanetary space, and did not yet receive nearly as much heat from the sun as the earth does. It must however, be due to some kind of solar does. It must noweer, or due to some kind of soins artion, for it increases very rapidly as a comet approaches the nun We can reproduce the same spectrum in the ishoratory by passing an electrical discharge through a vacuum tube containing compounds

of carbon and nitrogen at very low pressure it is of special interest that, even if the carix compounds form but a small percentage of the gas in the tube, their spectrum becomes relatively prowhen the pressure is made very small say 1/100 000 of that of ordinary air It may be, therefore, that at the lowest presences carbon compounds have an ex-ceptional calacity for shining, and it would be unsafe to conclude that they are the principal gaseous constituents of the comet, because they give off almost all the light

It may be added that the cynnogen bands in the spectrum nie producel net only by the polyonous gas of that mane but in all cases who excises and ultrelogether under chairbal excitement. For ex gen are logether under cleirial extlement. For example, they are very strong in the spectrum of an ordinary are light where the ultragen comes from the are and the carbon from the terminals. It would be out as prasmable to conclude that me are light was polemons after looking at it through a spectre from a distance, as he make the same deduction ab

Whatever may be the origin of this intrinsic light of omets it is responsible for most of the phenomena while make item of general interest for aimost all the light of the tall as well as of the head of a bright comet is of this kind. If Halleys comet shows by reflected anniight alone it would be barely visible to the noked eye, even under the most favorable circum.

Actually owing to its intrinsic light it has been a considerable object at every return for the last 2,000 years. The only gape in the record—in A. D. 912—has lately been filled by the discovery of nomistakable

references in old Inpunese chronicles.

The principal quantity of matter composing it must The retual quantity of mutter composing it must however be very small as compared with the more famility heavenly bodies at he possible to form a rough guess as to its amount by considering the amount of light which it relieves when it is not shiring on its own account. From the estimates of magnitude made last Soutember, it appears that a single body made last Siltenber, it appears that a single odey only a little over 30 miles in diameter at the distance of the comet would have sent us as much reflected light provided that its reflecting power was equi-tion of the mean, which is lower than that of most of the planets

It is, therefore clear that the comet must b posed of separate particles widely separated. The eter) is about 120 million square miles, while the ever) is about 120 inition square nities, while the total area of all the reflecting particle, according to the above estimate is about 1000 square miles. A ray of sunlight falling on it has therefore less than one chance in 100,000 of being stopped, and all the rest of chance in 100,000 of bling stopped, and all the rest of petiting throats some enuty space. It is no worder that commis are immaparent, and that stars san been through them; if we only knew how big these particles were, we could now estimate their number and their total name. But here we are quite in the dark. As the light of the comes seems uniformly diffused and it shows no signs of resolution into points of light, the number of particles composing it must least be coursed by insusant. Their average diameters of the composition of the com

But low much smaller than this limit their actual dimensions may be we do not know if, purely for illustration, we suppose that they average an inch seroes, there would be some five or als millions millions their This success like an enormous number, but we calculate the lank of the comet we find that there would be only five or six parities per cubic mile of space on the average loside it. Near the mile of space on the average lostde it. Near the center they would deduties be more closely packed, center liey would deadties be more closely packed, and more thinly toward the outer paris of the comet. The combined bulk of nit these particles would be about 80 million cubic yards a large amount from the engine ring similation but not equal to the quantity of water which falls within the limits of the smallest State in the l'nion during a heavy rainstorm

This may serve to give us some idea of the extreme the comet as a whole if we took a sp as big as the comel, that is, half as much again in diameter as the earth, and sowed ordinary golf balls through it at the rais of two or three per cubic mile, leaving the intervening space absolutely vacant would get something that would look quite as bris as Halley's comet - if out alongside it when it first

The gaseous matter width gives most of the light at perihelion probably comes out of the solid particles as these grow warm under the sun's heat when they approach it As the gas becomes luminous under solar action, the brightness of the comot increases and its regions originally invisible because the number of reflecting particles was too small to influence our

eyes, gradually come into view

Some of this is repelled from the head of the co by little known forces, and driven away from the sun by the action of the sunlight which, as is well known, exerts a force of reputation which, if a particle is ex-ceedingly small as are the gaseous molecules, is stronger than the airraction of the sun

stronger than the altraction of the sun Thus arises the long and magnificant tail which, like the smoke-trail of a steamer at sea is ever being renewed at one end and fading away at the other, swen though it seems to accompany the comet'in its journey

As the comet recodes from the sinn, much of this are outs matter has thus been lost, never to be regulared. Some of the remainder probably condenses tound the solid particles when they become cold, and

one co-apes into space

The comet is thus gradually losing its se and in the course of ages it may be deprived of all its tall forming material, and lose its former glory This seems to have actually happened to some of the short period comets, one at least of which has disappeared altonath. n

allogethr
Halloy a comat is perhaps preserved from such a
fate by the longer interval between its returns to the
region near the sun, where its activity takes place it
may be too, that it has more of the right sort of material to spare for a tail. But the time may come terial to spare for a tail when the time may come when most of this is lost, and its successive appearances may gradually lose those impressive features which have so long inspired awe and wonder in the hearts of mankind, and dwindle at last into something which the professional astronomer alone will be in

The Mercury Vapor Lamp and Sta Effect on the Rye. About a year ago we published a reference to a report of Prof J Norman Collie, FRS, stating in effect that a German medical journal had described certain cases of alleged injury inflicted upon the eyes by rays of mercury vapor lamps These cases referred certain cases of alleged infary inflicted upon the eyes by rays of mercury vapor lamps. These cases referred to all prove to have resulted not from the meccury vapor liminshing faum, which is now so largely in use in this country and which is constructed with a tube or container of glass, but from a special lamp used in medical, storillation, and chemical processes, bearing a quarte container. The medical or settliting lamp, to be sure, uses mercury vapor, but its container being of quartx, it is transparent to those rays which being of quarts, it is transparent to those two a winter may be injurious to the syes, while glass is opeque to such rays and does not permit their passage. The quartz lamps reforred to by Prof. Coilis are intertionally made to emit germ-destroying ravs Dr Charles P Stolnmetz who has made a careful study Charins 1º Mulinivez who has made a careful study of mercury vapor lamps used for illuminating pur poses, stated in an article in the Electrical World and Engineer of February 21st, 1901, as follows "The micrury are therefore is the only known arti

ficial illuminant which is perfectly harmless and thus especially suited for use where accurate work has to be done by artificial illumination, as in drawing rooms, offices, factories, etc

The same scientist in an article in the Daily Union, Schenestady N Y, on January 17th, 1903, stated as

Therefore electric ilghts are less harmful than gas or oil lamps, being whiter, and the white daylight the least harmful while the mercury are light which is entirely devoid of red rays, is absolutely harmless, and a person can look straight into one of these merhe it

In one of Dr Steinmetzs books entitled "Radiation, Light, and illumination" he makes the following

The harmful effect of working very much under artificial illumination is largely due to its energy effect, incident to a large amount of orange, red, and espe-cially ultra red in the radiation of incandescent bodies used for illuminants and thus does not exist with 'cold light, as the light of the mercury lamp"

The Current Suppley

Prof R F Ruitan writes most interestingly in current Bupplement No 1789 on the manufacture of alcohol from sawdust and other wood waste. A novel type of automatic stamp-wending machine is described and illustrated Prof Charles Edward Lucko writes and Illustrated Prof. Charles Edward Lucke writes on the development of power systems. Prof Otto N Witts paper on fast and fugitive dyes is concluded Itarian I Smith precents some curious information on the wooden monuments of the Northwest Coast Iradians A highership of the famous Dmitri Vascovitsch Mondeloff is published A method of Instantaneous microphotography is described.

Official Motoorological Summary, New York, R. Y., March, 1910.

Official Neteorological Summary, New York, R. Y.,
Marsh, 1912.

Atmospheric pressors Highest, 30 St., lovest, 59 47,
meas, 30 S. Trumpersture Highest, 30 St., lovest, 59 47,
meas, 30 S. Trumpersture Highest, 78, data, 59th
and 2015, lovest, 34, data, 1201, mean of warmest
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onpared with the mean of 44 prars, 72. Warment
mean temperature of Marsh, 48, in 1803; collect mean,
state of the state of the state of the state of
Marsh for 40 prars, 72 and 2. Average daily access
in 24 hours, 035; data, int and 2nd; average for
Marsh for 60 prars, 73 and 2. Average for
Marsh for 40 prars, 15 S. Precipitation 086, precipit
in 24 hours, 035; data, int and 2nd; average for
Marsh for 40 prars, 101 Dedicates of this month of
marsh for 40 prars, 110 Dedicates of this month of
marsh for 40 prars, 110 Dedicates of this month of
marsh for 40 prars, 110 Dedicates precipitation, 174,
in 1874, least, 0.36 in 1910 Wind Provailing direo-

tion, northwest; total movement, 7,983 miles; average hourly velocity, 10.7; maximum velocity, 44 miles per hour Weather, Clear days, 13; partly cloudy, 18; honr weather, Clear cays, 10; party caroup; 24, cloudy, 5, on which 0.01 or more of precipitation co-carred, 6 Snowfall, 04 Mean relative humidity, 68.3. Dense fog, 2nd, 2rd. Sunshine, 68.2

The Highest Dam

At the hour of two in the morning of Sunday, Jane-ary 16th, the completion of the Shoshone dam in Wyon-ing was announced. This is the highest dam in the i, being 338 4 feet from the base to the parapet. worth, being 3500 feet from the base to the paragher. It is located in the profound canyon of the Shoshons River, in one of the wildest and most picturesque regions of northern Wyoming. The walls of the gorge are nearly people did not the proposition of the pr the stream At its base the dam is 70 feet across: on top it is 175 feet in length, and at the base the dam is 108 feet wide

The completion of this dam creates an enreservoir, having a surface area of ten square miles and an average depth of seventy fest. The capacity and an average depth of seventy feet. The capacity of this irrigation beats in galloss is something like 148,588,512,000. The construction of this great dam was attended with difficulty from the beginning, owing parity to the inacressible section in which it stands. The dam is to control for all time the great shoot of the Shoatone River and to provide an ample water supply for the irrigation of more than 100,000 acres of

exceptionally fertile land in the valley below, a portion of which is now available for settlers under the terms of the reclamstion act.

The contract for the Shoshone dam was let Septem ber 18th, 1905, to a Chicago firm for \$515,730 This firm, however defaulted, and the work was completed by another contractor

Hall-Cleaning Car,

When streets are chaned by aweep When streets are cleaned by sweepers, whose brushes push the dirt before them, the dirt is sweet Into the grooves of the street railrend rails and than compacted by the wheels of the running ears. The rails account with dirt offer a greater resistance to the electric current, harshy causing a greater amount of power to be used for the propelling of the cars. The rails must be constantly cleaned to avoid ions of current.

The Hanover Street Railway Company has built for this purpose a special rail-cleaning car It is similar astruction to a regular two-axis car, and has two 25-horse-power motors Between the front and rear wheels on both sides of the car are steel brushes, which wheels on both sides of the car are steel invalue, which locean the dirt from the rails This dirt is automatically removed by a vacuum pump, and deposited in a box built into the lower part of the car between the nates of the driving whoels The vacuum pump is easier of the driving whoels The vacuum pump is operated by an electric molor staked to the dirt box. To avoid the raising of dast in dry weather, a sprink are and two lands, bolding about 252 gallous of water har and two lands, bolding about 252 gallous of water. each, are provided

As soon as the box is filled, an automatic elerm notice

As soon as the bot is filled, an automatic slarm notifies the motorman who shits off the pump, raises the humanes, and takes the ear to a place where it can be emptied and made ready for another trip. This car can be run at any rate of speed allowable in sirvet trainic, up to 17% subles per hour, and still will work with good results. It can be run by one and and the amount of power used at a speed of 10 miles per hour, and still will work with good results. It can be run by one and and the amount of power used at a speed of 10 miles per hour is only about 3,000 vote per miles. The car can itsen daily an exercise of 45 miles of these will be a second to the second t of dirt per mile of track

Beath of Thomas A. Hazendale.

The founder of the box toe industry in this contry. Mr Thomas A. Hazendale, ded at Breviton, Mass., on April last the age of swenty. A native of England, The should be a supplementary of the state of the same of the

Boath of Them a M. Jefferr

Mr Thomas B Jeffery, who invented what is kn Mr Thomas B Jeffery, who invented what is known as the clincher possumate tire, died on April 2rd, at Punpeli, Italy He was for more than twenty-five years a partner of the firm of Gormulty & Jeffery, makers of bicycles. English by hirth, he came to this country at the age of eighteen, and settled in Chicago. He took an active interest not only in the development of the bireche, but in the sutmodella as well.

mth of Paul Throdore M

Pani Theodore Sieveri del January 11th, 1918, in Drasden. He was a well-known German manufacturer and inventor He is best known for an invention to which he appiled compressed air for hiereing yesself of gless of any desired sign.

Correspondence.

WANTED-A RICE MULLING MACRIME

To the Editor of the ECHENTIFIC AMERICAN
Whoever will invent a machine to hull rice, will be
as great a benefactor to the rice farmer and the conas Eli Whitney in the invention of the cott gin. The farmer often gets 75 cents per hundred or tess for bis raw product, and generally has his crop in the mill for months before he gets (his The mills are the militar months because of the necessity for large storage, but the real mili part of the viant is about the same in machinery as a flour mili. The main processes are two, the removal of the hull and the noval of the polish The former is accomplished by removal of the polish The former is accomplished by burr stones, but the grain passing from under these is not completely clear of the hull. The next process is accomplished by a cylinder of wire cloth containing a revolving core of absopatin with the wool on, which takes off the remaining hull and the outside of the grain as well. The native French of Louisians pregrain as well The native Frence of Louisians pre-pare their rice by means of a scoden peetle, which removes the bnlis and leaves the polish, the most nutritious part of the grain Usually the mills have an arrangement for coating each grain with parafin, but this is not even an improvement except in ap-

Whoever will invent a small machine, say in size similar to a farmer's fan mili, that will remove the buil from the grain, will remove the rice crop from the enormous toll now paid the miller, and give a cheap and healthy food to the people as a superior substitute for the present rapidly ascending foodstuffs to which we have been accustomed. There are large investments in the million of the crop but it ought to be a paying investment with \$9.75 profit between the planter and the consumer on each 75 cents received by the farm C. W CAMPBELL Johnston City, 111

THE EFFECT OF REFRACTION ON THE TRIANGULATION OF MOUNTAIN SUMMITS

A REPLY TO MISS PRUK'S STATEMENTS IN THE PRESS

To the Editor of the SCIENTIFIC AMERICAN To the Editor of the SINETHICA AMERICAN Blace the anononcement by Mrs. F. Bullock Work man of the results of the recent releasifies and carefully accepted measurement of the two summits of Moint Hansarana by the professional engineers and out to Peru by her from Paris, Miss. A Peck has accorded to press with communications, the wident purpose of which is to believe up her assertions not based on any which is to boister up her assertions not massed on any measurement data as to the height of that mountain by attempting to discredit the figures obtained by triangulation the most accurate method of measuring stittude known. To effect this the communications contain a quotation and two statements, one of the seurd and self-contradictory in its to brought together as to tend to befor the mind of the brought together as to tend to being the mind of tra-reader and lead him to infer that in general the re-sults of triangulation of a mountain summit by an expert engineer are likely to be vitiated to an extent of 4,000 feet by refraction

of 4,000 feet by rofraction
The quotation from Mr Mumm and the statement
attributed to Dr Collie, the one a publisher and the
other a chemiet by profession, neither of whom, so far
as I know, has ever claimed to be an expert in attitude measurements, merely repeat in general terms what is well known to engineers that no method of determining the exect amount of refraction having been vet ing the exact amount of refraction naving oven discovered, the present bolgsts of certain high mountains obtained by triangulation may be somewhat changed, either higher or lower, should such method be discovered in the future. Such change would probably not be great in any case, and in many acoust acould be very slight, varying from mothing to a few would be very slight, varying from nothing to a few feet, for no coefficient of refraction that is likely to be

used would greatly alier the results now obtained

Between the recognition of the fact that figures
obtained by triangulation may not now be absolutely, though they are essentially, accurate, and lous statement asserted by Miss, Peck to have been made by a nameless friend of a so-called 'former member of the British Royal Engineers' that he triangu our or the British Royal Engineers' that he triangu-lated the great peak K-5 and obtained a beight 4,000 fest greater than that now assigned to it by the Indian Survey, which impossible difference Miss Peck would have the public believe is due to refraction, there is

nave the pulse person is the description of an absolutely accurate method of determining refraction would affect chiefly the present altitudes assigned to certain very high dayan peaks, such as Mount Everest, which were triangulated from very distant points low down in th Indian plain, and to a less degree some other high phalis also measured from distant stations. At the layan surveying, speaking of the very highest moun-tains said "Wa do not know exactly, and at present there is no means of determining, what the exact effect

there is no means of determining, what the exact effect or ferfraction may be in those sittudes, and the result of variation when applied as correction to those observed tripomentrical sittudes may be considerable. To show what he judges to be considerable may be added his further remark. "Mount Everest will probably prove to be some hundred feet or so higher than we at present revion it."

Observe that file Thomas considers one hundred feet in 29,003 the present height assign Everest, a considerable change in the sittude of that peak which is the most extreme case of all on account of its great sittude, its distance from the measuring of its great altitude, its distance from the measuring attainers, and the large amount of moleture in the air above the hot, steamy piain of Beogal He does not for a moment embertain the flayer of 4 to 60 feet and to be auggested by the frie hof of the British Royal Rogi neer If Bir Thomas's estimate be a probable one in this case, in the more favorable ones of lower summits measured from near stations the amount of

correction would shade down nearly or quito to zero

Now Miss Peck supposes an allowance similar to the
friend of the Royal Engineer's 4,000 feet made to the ascertained height of Huascaran and asserts, "It migh easily happen that the mountain is one or two thou easily happen that the mountain is one or two thou and feet higher than it has been figured," which would bring it up well toward the attitude she has estimated it at. Such a supposition is not tenable Even if the 4000 foot statement regarding K2 were true the conditions in this case are entirely different Her plan is ingenious but not creditable to her knowl edge of the principles of attitude-measurement Sup-positions have no plate in this field. Observed facts are what count.

M do Lasminst and his assistants who are expert engineers and know what they are about triangulated the two summits of Hussearan from four accurately red stations at an aititude of 12500 feet, i immediate neighborhood of that mountain in perfectly ticar weather. Here was no immensa distance, no haze in the air no great height of the aummits above hase in the air no great height of the aummits above his stations, as in the case of the great Himalayan peaks mentioned, to cause any appreciable chance of error due to refraction. Refraction in this case, if not allowed for at all would be practically a negligible quantity. His results determined from four stations being usually considered sufficient to insure accu racy, must be exact to within a very small figure. Prof. Fr Schrader and M Henri Vallot of Paris after careful personal examination and checking of all careful personal oxamination and clueking of all M do Larminate observations and calculations have indorsed them as correct. The indorsement of eugineers of such worldwide reputation as they have is a sufficient guarantee of the accuracy of the work. Miss Peck may therefore rest assured that this triangulation cepted by engineers and experts as arenra and definitely settling the question of the attitude of

and definitely settling the question or the attitude of the two summits of Husscaran Miss Peck makes two other statements, the relation of which to the attitude of Husscaran is not apparent (1) That I "Improperty claimed" a world record with (1) hat 1 improperly calimine a worst recurs with 23 394 feet, and (2) that Mr Graham's ascent of 'Monnt Kabru, about 24,000 feet, twenty years carler, is now quite generally acknowledged " Mr Graham on bis return from the Eastern Illimalaya claimed to on our return from the Eastern Illimalaya claimed to have nearly ascended Mount Kahru as well as to have made a number of other high ascents. He gave an account of his experiences, in London His claims were very generally disbelieved at the time and atterward ers and engineers, and were especially by montaineers and engineers, and were especially disputed by the Indian Survey, the members of which were in a particularly advantageous position to judge of their truth. The grounds for discrediting his secent of their truth. The grounds for discrediting his second of Kabiu were serveral but the strongast of all, well known to the Strong ordination as some children to the serveral truth the strong of the second to the strong ordination and the second truth to the second truth truth truth the second truth tr

Some time after the event Mr Douglass Freshfield advocated Mr Graham's claim bringing forward no new evidence beyond Mr Graham's original account. new evidence beyond Mr Grann's criginal account, but busing his opinion on certain considerations of probability, which though specious were not con-clusive and did not convince the public He stood nearly alone for years Recently a few of his friends have expressed their concurrence in his opinion, and in the United States Mr E S Balch and Miss Peck have echoed the cry, though natiber of them can have any knowledge of the question that can make their ding it of any value. The world at large as remained either neutral or disbelieving.

It is noteworthy that Mr Graham had no .nstru

It is noteworthy that Mr (Finantin has no instru-ments, not even an ancroid, with bim by which to determine the allitudes he claimed to have reached so that, as in Miss Peck's case his ideas as to his altitides were bised wholly on guesswork. It is also

significant, as an English journal recently stated, that after his account given in London, he never joined in tha discussion that followed nor attempted by any further statement to defound his claim Not long afterward he disappeared, and, so far as i bave bed to learn, his whereabouts have slote remain

Mr Graham's account constitutes the only evidence available in the question if anyons after reading this chooses to believe that his claim to have ascended Kabru is valid, he has a perfect right to do so, but such belief does not afford any proof of validity, nor does it warrant the person holding it in asserting that Mr Graham's ascent is now quite generally acknowledged. The only verdict that can be reached, as the

matter stands is that of unproven in stating the above facts I wish it distinctly under atood that i am nol expressing my own opinion as to Mr Graham's claim This i have nowhere done either in lectures or in writing although such expression has been ascribed to me by others
With regard to Miss Pecks repeated as

i 'improperly claimed' a world record with 23 394 feet, I improperly claimed a world record with 23 394 feet, my position may be stated as follows — Although, as a matter of fact, this attitude sitsined by me in 1983, was and remained for several years the highest measured altitude reached on an ascent, and although I had ured artitude reached on an ascent, and although I had every right to publish I to the world as a record, with two exceptions I have never mentioned it as such either in public or in print not even in the volume 'tee Bound Heighls of the Musiagh,' by Mrs Bullock Workman and myself in which i have described my ascent to that alllinds One exception was a mention of it in one of the issues of Whos Who? The other was in connection with a paper on that ascent read before the Alpino Club in London in May, 1905 when

'The word record' in the title of this paper is us as referring to the highest substantiated ascent yet made in mountaineering. The contention that Mr Grabam reached an attitude of 24,000 feet has on various grounds whether rightly or wrongly been so strongly disputed that it must be regarded as far from proved and therefore the stitude mentioned car properly cloin a place among those acknowledged to have been made

in this year 1910, so far as Mr Graham's claim is concerned I was no rement to alter a word of that

in view of the above I do not think it would be in view of the above I do not think it would be contrains in m. to deprive Miss Prek of the distinc-tion of 'improperty claiming' is world record to which she herself has enjoyed a monopoly for the last two years. During that time her chief appeal to the in terest of the public has been not by scientific observa-tions on natural phonomena at high altitudes but by constant referation in the press without the authority of any measurement proof of claims to the attainment of an attlinde variously stated at from 25 900 to 23,000 feet which finally crystallized into 'it may be re-garded as certain that Huasemenn is above 23 000 fost if, as seems probable the height is 24,000 feet i have the honor of breaking the world's record for men

as well us women

Mrs Bullock Workmans engineers have now stripped her claim of all its and probabilities and brought it definitely down to 21 812 feet the attitude of the lower summit of Huascaran she claims to have WILLIAM ILL STER WORKMAN ascended

Effect of Bainfall on the Cetten Industry.
The amount of salofall and the development of the cetten industry in any region are intimately connected. The first proof of this rather surprising assertion is found in the continual codewor of inventors to devise means of giving to the air of cutton spinning as a proper and sufficient degree of humidity. But a deficiency of natoral humidity cannot be perfectly remedied by artificial means, and it is a fact well known to all cotton spinners that the proapindies is considerably increased by the constant prosence of a large amount of moisture in the air The moist climate of Normandy has made that prov ince the chief sent of the cotton industry in France a similar reason Manchester has been center of the English cotton magnifucture. In addition center of the English cotton maoufacture. In addition to a moint atmosphere the cotton indostry requires abundance of water in its visible form. Cotton mills are always located un or near wireams and are pro-vided with capacious reservoirs.

Hence the great diminution in the rainfall of the fanchester district which has taken place within the last half ceniury is a valid cause for alarm Heakeil collated the records of rainfall made between 1880 i 1908 He finds that the mean annual rainfall and 1908 was 36 inches between 1860 and 1886 but only 27 1-3 inches between 1886 and 1908. The observed shifting of one of the branches of the Guif Stream is suggested as a possible cause of this great decrease in relatati which threatens the industrial prosperity of Maoches ter and the surrounding district -Cosmos

THE DISTERNATION OF BAILWAY CARS.

The DIRECTORY OF ALLWAY GAR.

The running of a railroad in Germany is evidently accompanied with unpleasantness, if one may judge from the accompanying photographs The Potsdam shops, which are responsible for the proper main tenance of rolling stock, have been confronted with the tenance or rolling stock, have been controlled with the difficult task of disinfecting the cars. It seems that the coaches which return from itsusia are literally a-swarm with sermin. Even after the cars had been cleaned with true Teutonic thoroughness, there was channed with the Tentonic therougeness, nere was still the possibility that living disease germs might birk in the walls and hangings. It was therefore, the practice for some years to take down all the upbol stery curtains etc. and to clean.

rything thoroughly Natur ally, the expense involved we heavy and the cars were with held from service for a considerable time Moreover, there was also the danger of infesting the

shops and other cars

The problem seems to bave been successfully solved by Julius licen successfully solved by Julius l'intsch who applied to the rail way car a principle of disinfec-tion which has been successfully employed on vessels. His disinfecting apparatus consists of an iron cylinder built up of cast iron annular sections of 16 feet in-turns diameter. The inside length is about 72 feet. The cylinder is so sioutly constructed that it can easily support without deformstion s 30-ton car
During disinfection the air

within the cylinder is considerably rarofied by a pump, and as a result the outer oir exercises o pressure of about 1,900 tons on

the disinfecting cylinder Since the apparatus is n allowance has to be made expansion. Hence the cylinder is mounted upon ers, so that the apparatus can yield to an extent for expansion of about three-quarters of an inch in length, which is amount of average

Before it is run into the cylinder, all the windows Before it is run into the cylinder, all the windows and transcus of the car are opened By means of a rance a two-ton closure is brought against the opened of the cylinder A rubber gashet is employed to make the closure hermette. Huge boits hold the closure, gasket, and criinder together Steam is blown into the interior of the criinder Two hundred and fifty steam pipes line the interior of the cylinder all receiving their sup total length of all thes supply from the main pi total length of all these pipes is about 1% miles. In order to heat the air within the cylinder quickly and at 1% miles

uniformly, two blowers are set in so that all the air is motion, so that all the air is brought in contact with the boat ing tubes. Even during the cold cut weather the lemperature within the cylinder can be raised to 140 deg F in from one to two hours in order to heat an entire coach to this temperature, about five hours is required. After the car has reached the proper tem perature, the air is pumped out of the cylinder until a vacuum of 70 to 74 centimeters of mercury under the normal pressure is ob-tained. At this atmospheric under the normal pressure is ob-tained. At this atmosphere, pressure water will bell at 104 deg F Hence all moisture is avaporated from the car without injuring the parts by the exces heat in no other way is a in no other way is it sive he The uphoistery curtains, hang-ings etc., are not in the least in-

For very special purposes the ror very special purposes the cars may be disinfected with formaldehyde gas Ai the very first attempt a car was ther-oughly purged of vermin To make assurance doubly sure, and to test the efficacy of this formal

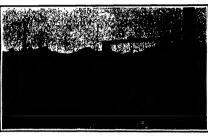
dehyde disinfecting method a giass vessel full of the living insects had been purchased from a professional vermin-exterminator in Berlin. This vessel was vermin-exterminator in Berlin This vessel was placed in the car and covered with cotton and linen The insects were all killed The apparatus has also been employe

wet cars as well as cars pervaded with the nu-pleasant odor of cooking. After twenty-four hours they were quite ready for service again. In this case no formalin was need

Liniment for Burna.—40 parts sugar lime, 10 parts giverine, 30 parts carbolic acid oil, 3 parts saiol.

SOVERWENT IRRIGATION IN THE TAXINA WATER-SEED -TER TIRTON CARTON CANAL. BY DAY ALLAY WY

The region adjacent to the Yakima River in ern Washington is the location of a group of irriga-tion projects which are notable for the engineering res. The topography of the country reveals a er of areas of arid land, separated by hill ranges which prevent water being distributed from a single source of supply The engineers of the Reclamation Service have made an investigation which extended from the lower portion of the Yakima River to its head waters in the foot bills of the Cascades, and



The huge cylinder in which German railway cars are disinfected by steam and aldehrde at Poissam after their return from a trip to Ru

have planned five reservoirs and distributing systems, which will have a capacity to irrigate no less than 350,000 acres, making this group of projects one of the most important in the West. The various works are the Trivoir, Sunnyaide, Wapato, Kettiras, and reference of the state of the st have planned five reservoirs and distributing systems

Of the projects, the Tieton is most interesting from scientific standpoint, owing to the difficulties a the route, the various applications of power, and th fact that without the use of concrete the project tunnel sections are of circular form & feet 114 in-

of circular form, 6 feet 1½ inches in diameter, with concrete shall 4 inches thick. This canal and tunnel lining are made up in 2foot lengths, manufactured on the flats along the river bank, where concrete ingredients are readily obtainable, and lifted to the canal obtainable, and ifficed to the canal line by cashe holats operated by alectric power. These holats are used successively at points about two miles apart, and the concrete shapes are transported along the canal between holats on railroad tracks laid in the bed of this axesvated route

This plan was adopted for the reason that beds of sand snitable for concrete were found in the bottom of the river in fact, the Tieton valley was made the site of a povel concrete works. The question as to how to transport them to the work was answered by the use of electrical power series of transacts were built at convenient points up the side of the canyon operated by cable

hoists These hoists in turn were served by a series of electric motors socuring current from a power station constructed for the purpose The concrete as fast as mixed was moided to the proper dimensions rast as mixed was monted to proper dimensions in portable molds mounted on wheels, so that they could be drawn from place to place. After hardening had taken place, the forms were set upon trucks having sides of steel framework. These trucks were mounted on the tramway, and the material bauled to

mounted on the transway, and the material basined to the top ready to be set in place.

On the Tieton project 10,000 feet of tunual were necessary, divided into two sections of 3,000 feet each and one of 4,000 feet in excavating these much of the formation was found to be or black beast rock requiring special machinery to remove it in making the tunnel excavation a circular bore 7% feet in diameter was driven by machine drills. Tielon River has

a fail of from 50 to 60 feet per ntie, and advantage was take this to develop the power re-quired for operating drills and other machinery and for lighting purposes A power canal 3,500 feet long, of 180 second feet maximum capacity and 34 feet effect tive head, has been completed which supplies water for operating a Frankiin air compres capable of compressing 1,250 cubic feet of free air per minute to a pressure of 105 pounds per inch, a Westinghouse generator to a pressure us as the control of 120 kilowatts capacity, and one set of 26-inch twin turbines.

About 500 horse-power is developed. oped, ample to operate the six electric drills, six air drills, shop machinory, pumps, hoists, etc., and to light all the camp build-ings. The turbine is regulated by a governor, and the power canal is provided with an ample autois provided with an ample numeric overflow, just below the power house. An electric transmission line, carrying 2,300 volts, has been constructed to the upper portal of Trail Creek tunnel, a distance of seven miles. Electric



Scaling the cylinder with a two-ten guakated closure before exhausting the air and turning on the steam.

THE DISTRIBUTION OF BAILWAY GARS.

would have been impossible through a deep canyon with very steep sides, the height of the bluff ranging in places as high as 400 feet from the bed of the river to the level of tha canal The water of the Tieten is diverted by means of a concrete dam thrown scross the stream Although of a concrete dam thrown scross the stream but three feet high and 200 feet long, the reservoir thus made is sufficient to fit is main canal 13 miles iong and lateral canals having a total of 51 miles. In one and several cannis saving a total or of mines. In conveying the water from the dam to the polent of distribution, the only practical route which could be located was isrgely along the side of the canyon near the top, the rim being of sech formation that it week

drills are being operated at th two portals of Trail Creek tunnel, and at the upper portal of Tleton tunnel. At the lower portal of Tleton tunnel, and at both portals of North Fork tunnel, air drills have been installed.

Another difficulty in the way of building the Tietre

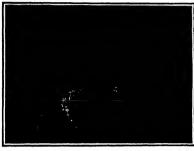
Another difficulty in the way of building the Trieton project was the crossing of a number of ravines contributed that the crossing of a number of ravines contributed that the contributed that the contributed that the contributed that were made from trails in the contributed that of the arched type and vary in width from two facts or of the arched type and vary in width from two facts that the side of the larger come being measured in the contributed that the contributed that the contributed that the two that the contributed that the ravines. The tents deposing any pagestics (the ravines of the tents deposing and pagestics) (the contributed that the co

Tieton project is very small considering the work which had to be pricerously and the acreage which will be served by the water, a trust which will agree will be acread by the water, a trust which will agree work it was necessary to have a telephone line 3 miles in length, wages reads along the route of the canal, and tunnels as well as temperary settlements for the workmen in the valley and on the rim of the

Increased Cost of Army Halicon.
The numerous published accounts of high prices of food and the hardships which have been inflicted upon the second of the se

tioned before the price of bacon has so incr to make the change desirable

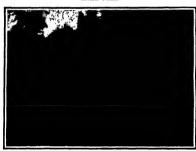
The garrison ration is steadily increasing in price scause of the general rise in the cost of food prod because of the general rise in the cost of food products. When the estimates for army subsistence were made last May for the next fiscal year, it was assumed that a ration would cost 20% cents. By January of this year the cost had increased to 22 cents, making



The canal consists alternately of open semicircular concrete conduits and circular tunnel.



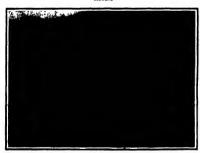
Building the open section of the Tieton conduit. Note the weeden forms for the concrete.



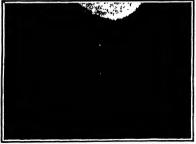
One of the portable melds used in forming the concrete facings of the



The molding yard, showing the concrete lining sections ready for delivery at the canal



The 4-inch concrete lining was built in sections in the valley and lifted to place on the side of the canyon.



Side-bill excevation for the Tieton canyon

canyon. The land, however, is especially suited to the raising of forage, fruit, and hope and is located on three important railroad lines having connections with the principal cities of Washington.

Omment for Burns.—Indatorm, 50 parts; extract of coall, 40 parts; carbolle acid, 1 part; rece unquest, and parts.

COVERSMENT IRRIGATION IN THE VARINA WATERSHED,—THE TISTON CANYON CANAL, To those of us who served in the Spanish war, and had the canned or corned best served us as a part of the require ration, the new will not come as a surprise, but the man who reads this will undoubtedly think of the good bee' he get as thouse and worder why complaints about he made.

One particular reason why the army will now use certain best in from the point of economy, for as meaning the contract of the particular of the point of economy, for as meaning the cannot be contracted to the contract of the cannot be contracted to the contract of the cannot be contracted to the cannot cannot be contracted to the cannot be cannot be contracted to the cannot be cannot be cannot be contracted to the cannot be cannot be contracted to the cannot be cannot b

It necessary for the War Department to submit a deficiency estimate to Congress. If the present rate of increase keeps up, the cost will be nearly 23 cents by the end of the next facal year. When it is considered the out of the local near year. When it is immurred that the army annually consumes several millions of rations, it will be seen that an advance of even a fraction of a cent in a single ration means a big advance in the aggregate for a year.

NOW GAMPLERS CHEAT

Games of chance have siways had a fascination for sil classes of individuals, at all ages, and the profes-sional sharp has made this weakness (which in some persons is developed into a ruling passion) a some persons is developed into a ruling passion) a means for carring an easy live libood at the expense of the numerous flats' who visit the race course or other places where gambling is looked upon as a num or less legitlante passion. The ingenious mechanical devices which have

ling along mechanical devices which have been employed for this purposes are really automishins. Such change appliances as loaded dries are, of course out of date thought one ingentious sharp invented a table line top of which was sheet steel ander a very thin cloth overling. By means of an electro-magnet concealed within the contraction of the contraction of the conwithin the table, lis top could be con within the case, in the control of the verted into a powerful magnet, and the dies (which were prepared by having one side of metal while the rest were bory) could be attracted to the table when the current was on or would fall in any hapshut of Dice, however are generally suspected and hardly anyone would ven fure to stake money upon the fall of the three card moute

three card mosts Cards are the most fertile field for the gambler's revenue. Winning at cards depends largely apon the possession of certain high eards or the aces which with the tricks and to gain possession of these cards is the gambler's object. For contribute, and the gain assuring this various devives have been employed called "holdonts" tuchanical conceiled in the sieve which by a wry slight pressure or movement in one direction, will instantly make the property of the contribute of the contrib certain high cards or the aces which the sieve of those was invented by a gambier named Koplinger and the de-vice has ever since been known as the Keplinger holdon! The appearing was worked by the kneen, so that no motion

worked by the anews, so that no motion of the arms or body was necessary A slight separation of the knees was all that was required to shoot the card into the gambler's hand. The knees were thereupon relaxed and the "holdout" receded like a fiash luto the sambler's sleave

Another variety of holdout is that concealed in the waistcost, and here the mind is need close to the body with the eards onispread while the thread is pulled, and in that manner a card abot into the hand ander cover of the remaining cards. This however, is a dangerous procedure whith is rarely employed. A small but ingenious species of holdout" is that known as "the bag". The small sharp point seen in the illustration is stack into the wood of the under

side of the table in such a man per that the flat bar runs alons parallel to and just touching the or more cards are now inserted into the clin thus formed, and may be withdrawn by the fingers in the set of drawing cards on the table loward the

A daring yet simple variety of 'holdont' is attached to the shirt sleeve under the cost and two small pointed books faring ontward press against the coat sleeve These books may be separated or brought nearer together by pressing upon a small ru If now a card be plaagainst the coat siervo, on the outside, and the clips separated outings, and the clips separated and then released, they will clasp the edges of the card through the cloth of the coat, and it will be retained there by the pressure of the spring in the "holdout." Bo long as the arm he held downward, the card is invisible, but the card may be

obtained possession of by the fingers of the other hand when resting against the sleeve of the arm to which the "holdout" is attached

A still simpler device is to have a small pocket out in the coat eleeve at the seam. The "pocket" is merely a slit about three inches long, into which the mereny a sur among tures menes long into which the required card is inserted. The fingers grasp the card and withdraw it with the others at-the required moment. Another variety of "holdowt" is known as

the 'ring holdout." A ring is worn on one of the fingers, to the inside of which is attached, as part of the ring, a small wire ellp or spring, flesh colored The card is inserted under this spring, and in that The card is inserted under this spring, and in that manner is retained within the paim of the hand by the pressure Experts in aleighted hand would not require a cilp of this character, being analied to paim the card without any mechanical aid.

sides such devices as those just mentioned, the



THE PLANCE ATT OUTSIT OF THE GAMBLES

gambler depends for his success partly upon his dex-terity in handling the cards during the actual progress of the game. Of course marked cards are frequently omployed for this purpose but the expert gambler will succeed in marking the cards with his thumb nail during the course of the play, so that, at the end of a few hunds he knows practically every card in the pack from the alight indications upon its back Rometines, also cards are bent more or less alightly to insure their recognition—either individual augnity to insure their recognition—either individual cards or a number of cards together. If half a pack is bent in this manuer this is called "the bridge" Each card in this section then has a slight curve, as



SOME GAMBLERS' TRICKS WITH CARDS.

Carrie Williams

A gambler may were deal to himself or to say person forming the circle a particular egrid which is known to him. This card is at the bottom of the pack, and the "sharp" deals of the cards from the pack, and the "sharp" deals of the cards from the part of the cards continuously ustil he reaskes the person into whose hand he desires to pince the card next to him, when, by a rapid movement, he withdrawn, not the top by the bottom card with his algave instead of his, distant. This track, when

vapidly and well eigensied, is practically undetectable. Ourd "sharps" also establey other devices for galaxia knowledge of the cards dealt to every member in the mirror to make this benefician, a small mirror is explored. Securities, as small tabled to a pulsely flower, and fixed to the under note to make point, and fixed to the under note of the table morest the dealer. If, now, in dealing, each card be passed over the mirror in term, the gambler will be enabled to tell the position of the gambler will be enabled to tell the position of the dealer of dealt, and to follow the cards before a single play on the made. A mirror of this character in a deagerous device, and it is easily detected. The contract of the cardy detected. In order to gain this kno

Appl. 16, 1910.

a single play can be made. A mirror or this character is a dangerous device, and it is easily detected. For this reason, very ingenious schemes have been em-ployed. A small mirror is inserted into the bowl of a pipe, laid carelessly on the table, the bowl being turned slightly upward and toward the dealer. Now, in upward and toward the dealer. Now, in dealing the cards, they are passed such in turn over the hori of the plps, and in this manner the magnifying glass it on tains conveys to the "sharp" all the re-quired knowledge, as to the cards con-tained in each sitter's hand. Occasionally "sharpe" employ a mirror ring for they purpose, a large signed ring being used which during the course of play, is evenus avound so that the signet faces the paim instead of the back of the hand. The signet then swings open on a pivot hings and discloses a tiny magnifying mirror beneath By the aid of this nitror, the majority of cards can be destected as dealt Al least aces and court cards can be distinguished from cards of lower values, which is the chief the court cards as the distinguished from cards of lower values, which is the chief There are a number of other ingustous devices employed by professional sharps, but the above will at iteast give the reader an idea of the extent to which the practice has been carried, of the re-

this practice has been carried, of the remarkable ingenuity displayed by me facturers of such devices, and of the dexterity and daring of the gamblers themselves in employing them.

Macrographic Examination of Metals The macrographic examination The macrographic examination of metale consists in examining with the naked syst its surface of the metal, which has been polithed and the chemically tracked in such a manner as to bring out the constitution and its importies. In uncovarphile to the constitution and its importies, in uncovarphile active and the constitution and its importies. In uncovarphile active active are the character and chemical properties of the alony, while macrography concerns their with the physical properties. The principle of the methods used in as old as the first methods of demaconish in which an acting interest the strips of I rong and side in which an acting in which an acting in the constitution of the contraction of the c

word blades.

The operation of macrography are essentially two first, the preparation of the policible durates, which must be absolutely free from greese, so-ondly, the chemical treatment, which is preferably effected with distinct scaphuric acid, in which the entire piece of metal is immersed for several hours. is immersed for several neura, or with an agreeous solution of iodine and potassium iodide. The indications furnished by the examination of the surfaces thus treated are useful in deter-mining the quality of steel and detecting the presence of slag and of biowholes When a bar of metal is cast there is freor mean is cast there is re-quently produced near the sur-face a blowhole which is filled with the more fusible impuri-ties. Usually this pocket extends through one-third of thickness of the bar Mi graphic methods show wha the blowholes have been a erated either by pressure or removal of the upper part the bar, and they are also a able of detecting in far pieces traces of th

which have been left after the tools

The statistics of the American Entirety Association show that the not surplus of breight care on the pash ways of the country on polescape 16th was 15400, as against 34,075 on Pubmary Smi: 26,546 or. James 18th; and Smil for Pumper 26th. The Increment do mand for bur care and past care has the second of the country of t

EIS TIX TREES OF TEE SUBTRIVET

The fir trees of the Faulie Northwest occasionally attain such proportions, especially in the territory attain such proportions, especially in the territory best out down are sumployed for novel purposes. In some portions of Washington one can see these bug stumps, which have been hollowed out and actually made into temporary homes for settlers. To make a stump hours, it is only necessary to remove the material from the interior, leaving enough to form walk or simple histories. Fine a root of boards or in the territory of the control of t gies is put over the top of the stump, holes are cut for windows end doors, and the dwelling is practically ready for occupation. A number of these stumps have been used by settlers on what are called logged-off lands, until they have been enabled to construct larger lands, until they have been enabled to construct larger and more convenient dwellings. After the stump home has been vacated, it is turned into a stable for the horses, or sometimes into an inclosure for chickens

or hogs.

Next to the big tree of California, or sequoia
as it is termed by the scientists, the fir as
found in Washington and Oregon
has the largest diameter of any

has the largest diameter or any tree in America, and probably in the world Soms have been cut down which actually measured 15 feet in diameter at the point where the incision was made. As they decay very rapidly after the timber has been removed, usually the in-terior can be hollowed out with little difficulty Sometimes they are used for dancing platfo is shown in the accompanying illustration, some being large enough to accommodate four couples. An other custom is to turn the hig other custom is to turn the hig stumps inlo playgrounds for the children, who reach the lop hy pieces of wood nailed against the sides or by ladders, and a pretty sight which a travelor often sees in the northwest is one of the big stumps turned into a flower bed and covered with the trailing vines.

How to Repair and Clean Typowriters, BY LOCK A PLANNING

As every user of a typewriter knows, the platen or roll is the part of the machine that wears out The constant hammering of the type against the surface of the piaten soon makes indentations in it, which in a short time amount to such a degree of roughness that it is impossible to produce good, clean

A compound has recently be discovered that will restore the platen to its original smooth condition no matter how badly it is worn

tion no master how badly it is worn or how long it has been in use. The formula and method of using the compound are as follows. The ideal material for use in repairing patterns would be hard enabler, but discussed the pattern in t amyl acetate, and various other solvents One of the best solvents

is a mixture of eight ounces of acetone and one ounce of amyl acetate.

of anyl acetate.
In the absence of anything sligh in the way of ceillu loid, any ordinary article made of this substance, as a count, may be used There is a variety of ceilluid used in the manufacture of combs which is quite set-inattenty for this purpose. The color also is good where this variety can be obtained.
In sufing cultiloid on plateins it is advisable to use outside, which is that will give it hardness, such as such powerful to the control of
similar substances. About one ounce of powdered emery to each eight ounces of compound is a fair pro-portion. Powdered soapstone also works well for the

The collision solution should be made as thick as a very heavy surper or molessee. In fact, set thick as skey be spread with a broad "The heavier it is when him, the somet's will set if it ight colored collision is used, it is, advisable to add some coloring major, which has he immediated as redeshably use of section of the coloring major is the coloring major, and the coloring major, and the coloring major is a set of the coloring major is a set of the coloring major in the coloring major is a set of the coloring major in the coloring major is a set of the coloring major in the coloring major in the coloring major is a set of the coloring major in the coloring major in the coloring major is a set of the coloring major in the coloring maj The celluloid solution should be made as thick as

grayish color Remove the plates from the machine. The work may be done with the plates in the machine, but great care must be taken to protect the working parts from the dust formed when smoothing up 1 it also takes less time to do the work when the plates is

removed

Wash the platen with gasoline to remove all grease
and dirt, and ruh it with a piece of fine emery paper,
to give it a new, clean surface With a brush, paint
the mixture carefully over the platen, giving it a good
thick cost,

Lay the platen aside for six bours or longer fo composition to harden. Then with a piece of fine emery cloth smooth it down, taking care not to cut quite to the original surface of the platen. This is the delicate part of the work, and upon the care used in doing it depends the quality of the job

doing it depends the quality of the job
Acetone and amyl acetate can be obtained at any
drug store. It usually requires from two to five hours
for the celluioid to dissoive. Breaking it up into small pleces hastens solution The solution should be pre-pared in a wide-mouthed bottle that can be securely



A SIR STURF IN WASHINGTON, BIG ENOUGH FOR A DANCING PLATFORM



STURP OF A FIR TREE IN WASHINGTON WHICH SERLINGS A PARILY OF FIVE

corked it should be shaken often during the process as this will prevent the colluioid from forming in lumps The bottle should be kept tightly corked and away from fire, for it is highly inflammab the mixture become too thick, thin it with a little more of the solvent, if it is not thick enough, add mor celluloid

empound for type

A cheap and simple cleaning compound for twitters is composed of the following ingredients
Paraffin oil 1 pint
Bensol 5 ounces

Karo

Karosene Mix thoroughly
This compound was for years a secret confined to
one or two of the large companies that rebuild type
writers. The machine is immersed in the compound
writers and removes which quickly and thoroughly dissolves and rem which quietly and thoroughly quisoriers and removes all dirk, gum, grease etc. It does not injure the enamed, but on the contrary improves its appearance parallel of an abright as when new in making up any making its abright as when new in making up any making its abright as when new in making up any tions given in the formula, except that should quicker drying mixture be desired the quantity of paramn oil may be reduced and the kerosene increased In all cases the lightest grade of paraffin oil should be used and not the beavier lubricating oils if white paraffin oil is used a water white fluid is produced. If dark paraffin oil is employed the liquid has a light amber color Oil of citronelli or oil of sassafras may amber color Oil of citronelli or oil of sarsairras may be substituted for the cresol which has no action whatever and is used simply to disguise the composid tion of the compound. To use the compound fill a tub of sufficient size with it. Place the machine in it and allow it to wought in the fluid for half an hour R litting it up and down gum and grease will be washed off. Then remove it and dry it with a soft cloth brush ing the parts not accessible with the cloth. About t The compound may be used as long as any of it is left as the dist settle a to the bottom of the tab and the clean portion may be drawn off. It is necessary to keep it covered tightly when it is not in use to prevent evaporation of the beard. A fair preparation may be

made by using one-third the quanformula an equal quantity of keroand from one and o two times as much gasoline

-----The Transformation of Sea Water

Into Fresh Water The belief was prevalent among the savents of the 17th and 18th carthen vessel dipped into the sea would fill itself with fresh water At the present day it is difficult to say on what this belief was ground ed it surely could not have been cd it surely outd not have been choiced by experiment in a similar sense Marsigli, the founder of occasiology made in the year 1726 and experiment which effected infiration of sea water through a system of fifteen poles filled with washed gorden earth or sand and placed as to let the water fall as If in a cascade it is stated that the palate disclosed a definite distinuition of the presence of salt Similar assertions are everywhere current among soumen A selentific test of the endeavor

to free sait from water was recent ly made by the French investigator Thould His report which appears in the minutes of the Académie des Sciences of Paris states that the presence of sait can be reduced by filtration forty continueters of the length of a glass tube which was one meter long and was placed in a perpendicular position was filled with seasand and the rest of the tube was filled with sea water por tions of the filtrate were examined at intervals of the experiment to ascertain its density and chemical composition. The result was that in the initial stage of the experi ment density as well as sadine can tent were found to be moderately reduced very somether after both recovered their original value The arly decrease of value is explain he the morbanical attraction which every chemically nentra body exer clars on the malecules of a substance in solution as soon as the body comes in contact t ith the so-

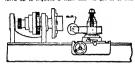
iution in nature too wend fails to effect the separation of sait. Through shipwrecked scames it became known that relatively fresh water may be found on very low and harren corn! rethe Pacific Ocean by digging to a trifling death in the coral sand it is not however as was supposed sea water freed from salt through the layers of sand but is simply rain water that is retained by a sendy stratum and by it protected from admixture with the ses water. Similar phenomena may be observed on the European coasts. They may be considered the key to the popular belief now contradicted, that water can be awestened by filtration through sand

According to the Electric Railway Journal, a novel type of electric locomotive has recently been built for canal haulage near Bremen. The locomotive runs on a quay which has to be kept clear for the passage of drays and for other purposes. To secure the necessary weight for adhesion it was decided to build the loco motive in the form of two U's with a connecting The current is taken from overhead wires



A TOOL FOR CENTERING WORK IN A LATER

The accompanying drawing shows a handy tool for entering work in a lathe chuck. When a job is to be faced off it requires a little lime to get it to run



SIMPLE METHOD OF CRETERING WORK IN A LATER.

true The drawing shows how the work can be expedited by the use of a simple tool. The tool is made of tool steel, the roller is hardened. When a job is placed in the chuck to be faced off and the face of the work does not run parallel with the face of chuck the work cose act run praises with the race of cause to roller tool is secured in the tool poet, and the lathe carriage is then run up by hand until the roller strikes the face of the job. As the work weblies in the chuck the high position will be struck by the roller and forced true with the face of the laths. After the work has bedd trued it is then ready for marbling

ALRING A LEAR IN A STEAM OR WATER PIPE hole will occasionally cause e leuk in a at or water pipe, after the piping bas been put up and perhaps been in use for a considerable time. It can be repaired with an ordinary carriage clip and yoke



MENDING A STEAM OR WATER PIPE

and bit of sheet rubber packing, eithough a piece of an old rubber shoe would last for years

an old rubber show would last for years. You can readly see the application by referring to the sketch. The writer stopped two leaks in steam pipes fifteen years ago by this melhod. The opines have been in service were also been in service were also been in service were also have not leaked. They exer both in rather inaccessable places, where it would have been difficult to remow the pipe. At the same time bring in out-off the-way places the appearance of the properties of the properties. the patch did not matter

GROOVED PULLEYS FOR EXPERIMENTAL WORK

Small grooved pulleys or sheaves can of course be d on the lathe but a substitute for the lati which in some respects is quicker and cheaper, will be found very edvantageous. The description of such a method follows

a menog rollows
in a piece of wood of the thickness desired for the
pulley bore a hole of a diameter equal to that of the
pulley at the boltom of the V-groove With a half
round rany or large drill counteraink this hole on both Suilt-do not say-the board in two down the



MOLD FOR CASTING PULLEYS.

middle of the hole, then nail or clamp it tightly to a smooth board the two halves being pressed firmly together. Find the center of the hole with a compass and drive in a headless sail taking care to get it vertical, to serve as a "core" for the bearing. Have handy a piece of cardboard considerably larger than the pulley, with a hole in its center the size of the

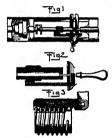
slip the cardboard over the nail and down upon the miold This will force out superfluous metal and make the upper side of the pulsy smooth When cool, unclamp the mold and pull apart where split. A knife or rasp will then do all the finishing necessary Two or rasp will tend do all the miniming necessity. Two or more pulleys can be east together by placing the moids one upon the other, with their centers common. The figures above such a combination. A bub may be made in a similar way. If a stronger bearing is wanted, as of an idler, wrap a strip of brass around the nail and let it become soldered to the metal.

iet it become soldered to the metal.

Along similar lines a cogwheel may be cast, but
great care is necessary in cutting the tech in the
wooden mold. A large number of pulleys can be cast
from one mold, and for duplication work this method
will be found quicker than the lathe.

HOW TO GUT THREADS WITHOUT A SCREW-GUTTING LATRE OR THREAD-CRASING TOO

The ordinary way to cut a thread by hand is to use a thread-chasing tool with the number of teeth per inch wanted. The difficulty in chasing a thread is in the starting. It takes a great deal of practice, and over them a "drunken" thread may be the result. The accompanying illustrations show how this can be done in a very simple way and yet give an absolute the starting of the starting thread the starting thread the starting thread
intely true thread If a number of arraws are to be cut the best way to proceed is as follows. Take a thin place of tubing that will just if to vor to har or belt to be threaded in one end drill a small hole, into which fasten the and of a aprise brass wire, preterably by soldering Then wind the wire around the tabe half; a doesn or more turns. Now take a thread gaze Select the number of threads per both wasted and place il length-wise of the tube, when if a cach wise of the tube, when if a cach when of the tube. I when it is cach to the control of the cach when of the tube. I when it is cach to the control of the cach when of the tube. I when it is cach to the control of the cach to the tube of the tube.



SCREW-CUTTIES ATTACEMENT FOR LATERS.

notch, after which puil the free end of the wire and keep it tight Solder the coils to the tube, using only the corner of the soldering from them more the gage one-third of a turn around the tube and repeat the soldering and finally move the gage again an equal and solder

it will now be seen that there is a perfect thread or it will now be seen that there is a perfect thread or spired around the tube, which we will call the masser thread. This master thread must be slipped on the hor or boil to be threaded so that it will not turn, allowing enough room at the end for the threads to be cut. The cutting tool consists of an ordinary hand tool, with only one point. Procure a small piece of wood, joing shough to reach over the master thread and to the end of this boil. Into this piece of wood and to the end of this boil. Into this piece of wood

and to the end of the hott. Into this piece of wood crill a hole just large seconds for the cutting tool to slip through and dit saught in operation the cutting tool is held in the right hand, in the usual way. Then with the left thumb press the piece of wood against the master screw and start up the lather. The master screw will feet the cutting tool the right pitch has soon as a good start is obtained the tool will feed itself without the aid of the master screw. the master screw

When the thread is finished the master screw may oved and slipped over another bolt to threaded. The spiral may be wound right or left, according to the direction wanted. Any number of threads may thus be formed. That is to say if a triple torsass may thus be formed. That is to say if a triple or quadrupic thread is mantal, it is only necessary to wind three or four wires around the master thread and proceed as before described. This arrangement is also very handy in starting a thread when the ordinary chaser is used, as it will always insure a straight thread. It is not necessary to nick or mark the wooden block, as it readily takes the impression of the thread from the master screw

Fig 1 illustrates a plan view of an ordinary lathe, ready to cut a thread. Fig. 2 shows how internal threads may be out and Fig. 3 shows the mester thread.

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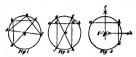
Very often it is necessary in the drawing room or shop to find the center of a circle, a disk or a p of shafting, etc., when the diameter is not given low are three ways in which this can be done

low are three ways in which this can be done.

The first, Fig. 1, is the method usually used it consists of two right triangles drawn so that their angles are in the circumference of the circle as a bo and dcf. The point where their hypotenuses inter-

and αr in point where their hypothesis intersect is the conter of the circle

The second method is shown in Fig. 2. Draw any chord as ab and take two points on it as ab quidistant from its ends. At these two points erect perpendiculars to ab cutting the circle at ef g and b. Then



THERE WAYS OF FINDING THE CENTER OF A GRECLE

draw i h and fg, and the point where they inter

draw 'h and fp. and the point where they intersect will be the center of the circle Fig 3 is similar to Fig 2 Draw any two chords as ab and cd and at their centers erect perpendiculars to them The point where the perpendiculars meet will be the center of the circle

HOW TO SHARPEN A PIPE DIE,

NOW TO SHAPEE A PIPE DIE.

FY ALPHADY IN BOTH A millicut file would sharpen a solid pipe file quite easily and cubilly without removing the temper in the die. The first fow rules of the file will side without cutting. But for the pipe file file just in the pipe fi



A PIPE DIE CAN DE SHARPENED WITH A FILM,

the flic will commence to cut, and will cut very smoothly making a keen odge on the cutting thread Herestofore I have slways worked on emery grinders to try to do this work without removing the temper of the die, but found they worked very slowly on account of the small diameter of the wheels, also that it was quite a nuisance to set the die for the cutting wheel Most mechanics would not try the file not having the least idea that it would do the work That

A "SPANISE WINDLASS."

Herewith is a sketch of what is known among cowboys as a "Spanish windlass". One end of the rope is made fast to the load, the other to a "dead man," tree, or fonce post. The vertical post or timber which is used as a drum is rotated by means of a bar placed in a nearly horizontal post-



A "SPANISH WINDLASS."

tion bearing against the vertical post but not fast-ened to it. The rope is passed around the end of this borisontal bar

horizontal bar
One man holds the post against the ground and
vertical, and a second man walks around with the
bar passing it above the rope, and time winding the
rope on the vertical post.
The whole windings moves toward the "feed many?
as the rope is weight, on my previous and and any

made in the ground for the vertical post to turn in al for pulling wagons a This windians is very useful for pulling wagons and autos out of the mud. All one needs is a rope and two posts or timbers.

THE WRIGHTING OF TOOL WANDLES.

How often it occurs that when a tool such as a brad awl or particularly a keen-edged chisel is thrown down in a hurry it will roll off the bench and fall upon down in a nurry it will rul on the south and and are upon the floor, perhaps into a give pot or upon the foot of the workman, or on a hard surface that will nick or duli the cutting edge The following little scheme is dull the cutting edge. The following little sceems is employed with all the wood-working tools of the writer and found to answer admirably. Bore a hole in that part of the handle that rests upon the bench, with a five-sighths rather dull cutting twist bit. Bore the hole only as far as the center of the handle, but no farther, or the object desired with be defeated. A dull cutting only as far as the center of the handle, but no farther, or the object desired will be defeated A duil cutting bit makes a rough-sided hole. Into this pour some meited lead (of course the lead should not be too hot). When the lead becomes set, trim it off evenly with a fine rasp and finish off with coarse sand paper. Now when the tool is thrown down hurrledly upon the work bench it will not roll over more than once and will come to rest leaded side down. This little dedge is not only inexpensive, it is thoroughly effective, it will not only save annoyance, it will prevent many an accident, which no one can realize more than the man who is handy in the use of wood working tools



BRAD AWLS WITH MANDLES WEIGHTED TO PREVENT BOLLING.

The illustration shows two brad awis, fitted as described, and used by the writer for several years.

AN ILLUMINATED GAS REATER.

The accompanying illustrations show how an illuminated gas heater can be made. The heater is mounted on a suitable pedestal, such as a wrought-iron stand or a base of some old discarded oil lamy. The heater proper consists of a hurner A, a serven R, and an outside cover or shield G, which is removable. A suitable handle is provided at the top of the cover

A striang name is provided at the copy of the purpose

Through the base passes an ordinary gas pipe, and
at its lower end a stop-cock is fitted with a suitable
attachment for a rubber base so that it can be connect
ed to the gas supply in the usual manner. At the upper end of the gas pipe is attached an adjustable sie sau of the gas lyne is attained a substance when the for regulating the proper proportion of all to be mixed with the gas. The sleeve terminates in the burner proper, which is made with double walls. The lower part is made conical, so as to better distribute the mix-ture of gas and air. The hurner proper is made from ordinary culluary utensits, the husdee part from a ordinary culinary intensite, in a made part from a small pan, and the outside part is made from a col-ander with very small holes, the smaller the better These two parts are rivered together at the top, so as to make them tight. The lower or conical part-may be made from ordinary black iron and may be fastened nade from ordinary black from and may be instance, to the upper part as well as to the lower or gas pipe in any suitable manner, as by riveting or seaming. The screen is made of wire netting fastened together,

any stitute inhiner, as by riveting or seasing.

"The screen is mused or vive notification to the control of th

number of holes at the top should be made for the circulation of the air and spent gases.

The cover may be cut out or perforated in such a

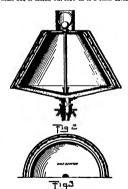
to represent a landscape or any conventional The inside of the shield may be lined with ray as to re design The inside of the shield may be lined with mics so as to render the beater more asfe. The mics may be thited in almost any color desirable Aniline colors are dissolved in amyl accetate, then mixed with amyl acetate colledion (commonly catted banana cill This mixture is applied with a soft brush and will It will withstand a great



A GAS HEATER IN THE FORM OF A LAMP

heat. When the hurner is lighted the cas will burn and form small him beads on the outside of the per-forated burner, and as the finne strikes the assestes fibers it will make them glow very britilantly and change colors as the fibers are moved to and fro by the currents of air passing between the cover and the

If artistically made the heater may be used on the top of a table and will be a real ornament to the house but, of course, will show off to a better advan



SECTIONAL VIEWS SHOWING DETAIL OF CONSTRUCTION.

tage in a dark room. The outside cover is not at all necessary, but is only used to get the desired effect.

FILES AND THEIR USES.

Nearly overgross who has had much filting to do, knows what a difficult thing it is to get hold of a reliable handle Wood ones will split even if forruled, or the brass ferrals will become battared and weaked. Sized cone are rurnly substanted, and the settlement of the settlement o

end of the file handle turn two %-inch grooves, plac-ing them % inch apart. Connect by two diagonal grooves of the same size, wrap with a piece of paper, and pour Bablit metal or solder in the top Trim up, and you have an everlasting file handle

A simple and inexpensive file cleaner is made by hammering either end of a medium or large sized

an imple either expected to institution. The supervised monitoring the this degree of hardness is not essential, the temper al ould be drawn by heating and cooling down slowly in order to render the steel less brittle In fact, the temper and quality of a good file are instanced by tha fact that the writer has seen made and has tried satisfactorily a razor ground from a 10-inch flat mili flie on a regular emery wheel and then honed and stropped into shape

Perhaps the first use I ever saw old files put to was revising the first use | ever saw out make put to was a full set of nail sets made from 6-linch triangular files by snapping them off to an even length at five links and grinding the points down to various sizes required. The top ends were rounded off nicety, and the treth were ground just enough to give a beautiful kuuried effect to the set 1 asked the mechanic who made these tools why he hadn't used rat-tail files and make them round, but he said he just wanted them different from the common run of tools. Same years later I did have the pleasure of sceing a leastiful set made from round files. Only with these there we left an unground strip between the two ends, to affor a good grip for the fingers

Another splendid set which was evelved out or



by a machinist who had oversion to do a tittle see int by a machinist was and occasion to do a nature ejection institute making from time to time, was a complete set of fittle V-shaped gouges and flat chissis and half rounds, all made with curved shanks to reach other than the complete of the wise list consible pister. These were made by forging amail files of the requisite cross section into the curve required, and grinding the shank and edge to the tool required, and grinding the shank and edge to the tool claimed by requisite cross section I mean that he niverse (took a flat file to make a flat their and their final grinding and sharpening. The tange do to the two same and their their and their and their their and their also their and their an

a convenient length, may five inches grind a good long taper on it up to the last % of an inch, and make the taper shorter to give more metal to the point, and there you are

Sometimes a file will help out a serious difficulty if it is only used. An occusion arose in which it was absolutely necessary to shear off some large spikes in absolutely necessary to abser off some large applies in some builting timber that had already been placed in a builting. It looked well nigh impossible until I al-thought to sharpen a fite to a redge on the blunt end similar to a cold chiefs, and by driving this in be-tween the piles it was a simple matter to cut the spikes, though to tell the truth it spoiled the edge of the file several limes before they were all cut. Perhaps the toost common use to whith they are put is to make them into burntshers for sharpening calibate arrapers and kindred tools. For those they are simply mounted in a handle and ground until

calibet arrapers and kindred toots For these they are simply mounted in a handle and ground until they are perfectly smooth "Triangular files are the ones commonly need for this purpose. A round file makes an efficient and for any purpose and with accrety any trouble to transform it ready for fits new duties as it needs only to be sharpened. An amateur desiring to take up hrass craft work, and not wanting to pay the exorbitant price powersity wasted for an outfit, deeled to make one from fits In less than two hours he had made every tool lile In less than two ours us as many every occurrent trated in a large assortment, and they were a credit-able-looking outfit, comprehensive enough for any ordi-nary purpose, and included all the customary plarcing, deating, tracing, and stippling tools.

RECENTLY PATENTED INVESTIGES.

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that when one also source downward, its weight its when one also source downward, its weight its when one are a power to little the water or the subar old.

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VHINCLE-THER—W W Sever Mampton, Va This invention refers to three for emer-gancy purposes. An object is to provide a the which may be carried with the white, and which may be slipped on line of a damaged lire, so that the vehicle may be drawn back to the place where the damaged tire may be

DESIGN FOR A THIMMING.—D. F Wart, New York, N Y In this case the strip of trimming comprises an ornamental design wherein the chief figure represents dominent stretched in oditions directions along the strip and between the opsecs three stars are clus-toxed in a triangle form

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Almost everybody knows something about railroad rules, but very few, unless holding or having held some railroad po sition, have a clear idea of just how many precautions are taken to prevent

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The part of the part sections their time-table rights as their as hedules time are so figured that they meet, years, and 504-67 are passed at certain stations and certain times. But some things will go wrong the feet of
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Furnace regulator O F Lawrence

ding is required to see this signal

nange from danger to clear At all stations a record is kept showing the departing time of every train at this station and at the next station east and west. Supposing a west-bound train to be west. Supposing a west-bound train to be approaching a station semaphore. The telegraph operator, if he has no orders on hand for this traio to meet anything at his station, consuits his block record, and if the block west is ricar he calls up the station west, and obtains permission to let a train in the block life then pulls his block signal clear and holds it in this position until the train is by, immedi ately reporting it to both block stations and the dispatcher

If a train from any cause has to stop between stations or finds itself on the schedule time of a superior train it has to flag, putting down torpedors and send ing a man with a red flag ahead and back ing a man with a red flag ahead and back notwithstanding the knowledge that the telegraph operator will not let another train anter the block until it is clear

Now, on double track things are very much simplified, as all trains going in one much simplified, as all trains going in one direction move on the same track, and only have to take siding to silow a train of higher class to run ahead. This silows the use of automatic electric hiock signals placed at intervals of about a milo, all signais being on the right hand side of the track which they govern At every one of these signais the joints between oce of these signals the joints between the rails are insulated, thus cutting the tracks up into blocks between the signals. These signals are so wired that when a train approaches one of them, if the block ahead is clear, the circuit will be com-ploted from one rail to the rail on oppo-site side of track through the wheels of the train, causing the signal to come clear, in which position it stands until the engine passes it if one of these signals engine passes it if one of these signals falls, the train is required to wait a min ute or two iong enough to allow a pre-ceding train to clear the block or to flag, and then proceed with caution to the next al, reporting the failure at first office

These automatic signals work over two thousand times to one failure, and ore so rucied that a failure leaves the sig nal at the danger position

stimation of the Working Caps a Man Before and After an Accident.

The problem of determioing the work The problem of dotermioling the work ing capacity of the within of an actident in divided into two parts—it is necessary to establish, first, the condition in which the accident has left the various cragso and functions of the body, and secondly, the effects of the consequences of the accident upon the power to work, either at the states a surgicus occuration. the victims previous occupation, if he is able to continue it, or at such other occu pations as he may be able to carry on Dr imbert in a receot article criticises the methods generally employed for the solution of this problem. The attendant physicians and the medical experts give physicians and the medical experts give only their personal opinions, instead of employing the exact methods of examina-tion which are used in physiological labotion which are used in physiological labo-ratories. Thus in many cases, in which the statements of the victim appear false or exaggerated, the truth could easily be ascertained by the use of X rays or by the electric exploration of the nerves and muscles D in Imbort describes various researches which he has made in the physiclogical study of certain occupa-tions. He thinks that it is possible to arrange a mass of useful data in a form in which they would be available for the decision of individual cases.

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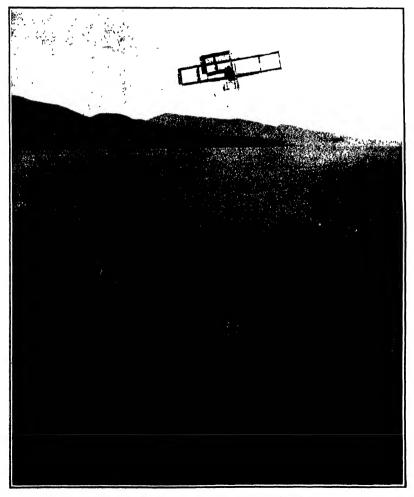
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A POPULAR ILLUSTRATED WEEKLY OF THE WORLD'S PROGRESS

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Network Annual Control of the State of the S

NEW YORK SATURDAY, APRIL 23rd, 1910 The liftit is always glad to receive for exactnation literated articles subjects of timely interest. If the photographs are sharp, the articles short, and the facts curlengte the contributions will receive special statution. Accepted articles will be past for a regular space rate.

TRUE WAY TO PREVENT BAILWAY ACCIDENTS.

) is well understood among railroad officials that the most fruitful cause of railroad accidents in the most trainful cause of railroad accidents in this country is to be found in the lax sense of discipline among the employees Presumptive moof of this is found in the fact that, although our icading railroads have been equipped with a block signal system and other safety appliances, which are suparal system and order easily appliances, when are generally equal and in some cases superior to those on European railroads, the number of accidents in proportion to the number of people carried continues to be larger in this country. We therefore note with much satisfaction that the thit ago and Northwestern Railway has taken a step to the right direction by appointing an official whose chief duties will be to make a study of railway accidents, and by a system of education and strict enforcement of discipling, en deavor to eliminate the most fruitful cause of injuries deavor to climinate the most fruitful cause of injuries to passengers and damages to freight Opportunity was recently taken of the reorganization of the companys ciaim department, to relieve the claim agon uf much of the detail of his work and silow him to uf much of the detail of his work and silow him to make a careful study of the causes of all accidents in the handling of passengers and freight it will be his duty to bring about a more thorough co-operation and a higher state of discipline among the various em-pluyees, upon whose fulfillment of their duties the asks operation of the trains immediately depends The scheme is a most excellent one, and we believe that its results will be so satisfactory as to lead to similer arrangements on at least the more important railroads of the country

AN EPOCH-MAKING EXPERIMENT.

T the last meeting of the Institution of Navat Architecia, a paper was read by the Hon C stop among the British navel architects and winn among the British navel sreditects and shipbuilders: It was described by Prof J A. Ewing of Cambridge University as speech making", and the amonumentests which it constained must be considered as as end only in importance to those which were unude by Mr Fernons after the uncoresult irlaid of his mix turbine drives steamer. Turbinis of Mr Farnons apper which was entitled The Appill sation of the Muricu Steam Turbine and Mrchanick in tearring in Merchant Ships. Gen Fibe the sucvessful

application of a combined steam turbine and reduction genr to a slow speed merchant steamer, the "Vespa-The Vespasian' is a small cargo stear less than a thousand tons displacement, which in her original condition was driven by reciprocating engines which were sufficiently up-to-date to be considered as whith were summinently up-to-date to be considered as expresentative of the average engine-room equipment of the modern tramp steamer. To make certain that the comparison would be trustworthy, and equally as orable both to the reliprocating and the turbine institution the reciprocating engines were throughly over-instead and put in first-base condition. The ship was then taken to see and put through a course of trials in which complete data relating to draft. weather water and coal consumption etc. were co letted. The vessel was then returned to the yard the returns the year was men returned to the year the returning to the year the returning team turbine with a 1 to 40 reduction gear was unusuited, the projector used with the reciprocating engine being left nutouched. The reduction gear consequences alsted of pinlon- on the high-pressure and lew pres turblus shafts and a large spur wheel on the propeller shaft. The gears were of cast iron and the whole was mounted in plain bearings without the use of any special adjustment devices. The "Vesposalan" was then coken to see, and put through a similar course of

trials to those which were run with the reciprocating engines Except for the aubstitution of turbines for reciprocating engines, the ship with respect to dwaft. otlers, and propeller was in exactly the same condition as in the first trials.

When the results came to be worked up, it was found that with seventy revelutions of the propeller, there was a net gain of from 15 to 16 per cent when steam for all purposes was considered, and of from 18 seem for all purposes was considered, and of from 18 to 18 per cent for the propelling engines alone Translated into terms of boiler power, this means that one boiler out of every six in the slow cargo boat can be dispensed with

Speaking of the important question of the strength of the mechanical goaring Mr Parsons stated that as the 'Vespasian' had been taken out in a heavy sea without experiencing any trouble with the reduction gear, it was probable that the gear would stand any thing that the shaft would stand In the discussion of the paper various shipbuilders referred to the longthing that the sinse violated in the class of the paper wireless shipbulded and refer to the long-standing preludic against mechanical artist, and it is not the importance of the control of the paper of the control of the paper of the control of the paper of the control of th

by the use of helkel gearing, which is the type that was used on the 'Venpasian,' it is possible to transmit large horse-powers with an inappreciable amount of west and with an efficiency of over 98 per cent, which is about the same efficiency as was secured by Mr

Now the vest importance of these 'Vespasian will be approciated, when we bear in mind that about two-thirds of the steam merchant marine of the world is of the slow cargo-carrying type, for which the steam turbine, because of its high speed of revolution, has been found to be unsuitable. Moreover, the 'Vespasia was the first vessel to be fitted with the new system and it is reasonable to conclude that with system and it is reasonable to conclude that with its further application to argo steamers, an average economy of at least 20 per cent will be guaranteed on the engine and 17 per cent on angine and auxiliaries, or as Prof Ewing put it, there will be a saving of one boller in six on the whole equipment.

nonier in mix on the whole equipment.
Furthermore, not only will there be economy at the coal pile but the reduction in weights will make possible a considerable increase in the exponentrying upacity in this connection, it should be noted that opacity in this consection, it should be noted that the United States Navy Department has authorised the installation of Westinghouse turbines with Melville and McAlpine gears in the new fleet collier No. 8, which is being built at Sparrows Point, Maryland i he space and weight saved by the use of this apparatus as compared with the reciprocating engines originally continuousled for this vessel, will enable it tons more coal, and it is belie to terry about 200 tons more cost, and it is such that the economy in coal consumption will be such that the economy in coal consumption will be such that the saving thereby effected will add another 200 tons to the net carrying capacity of the collier

WATERWAY DEVELOPMENT IN RUROPE AND THE

E noie that a contemporary sounds a word of warning ngainst precipitate action in the wholesale development of the water-ways of the United States, by drawing attention to a document issued by the British Royal Commission on canals and waterways, which it cun aiders to be worthy of serious study on this side of The report deals with the wa of Beigium, France Germany, and Holland, and our contemporary advises that it be studied in connection columporary advises that it be studied in connection with the revent report of the army engineers on the proposed 1-frost saterway from the Lakes to the Guilf III selatine that the Royal Commission report strongly mutatine that the Royal Commission report strongly mutatine that contention of the army engi-neers that the Musicipipi and the tributaries, with 11000 miles of navigable waters, as developed and mutatiated by the government, furnish as good as

multitationed by the government, furnish as good an intand vastermy system as any in Europe. In France the waterways that are used considerably include a total of about 7,500 miles of rivers and canals, and of that 1,500 miles of rivers and 1,671 miles of canals have been deeponed to a minimum depth of 6 8 and to a maximum depth of \$5 ceek, the bulk of the traffic being carried on water varying from 1 to in depth down to 15 feet.

in depth down to 15 feet.

In Germany there are 8,500 miles of waterways, the dapth of which in the rivers wariss from 2 to 6 feet, while on the lower sections of the larger rivers the depth becomes from 8 to 10 feet. The depths of the canalised rivers are from 2.8 to 7.5 feet, and of the cana's from 4 to 10 feet, from 4 to 6 feet being the most common Comparing these figures with those of the Mustasippi, we find that, swen in the Ion-water messon, boats of 25 to 80 feet frast may be sent from the Gulf of Mexico 370 miles to New Orleans, Baton the Gulf of Mexico 370 miles to New Orleans, Baton the Superior of travel \$40 miles farther to Caire, those of \$-foot draft may pass from Caire 183 miles to \$81. Louis; while those drawing 4½ feet may pass up the Minesetopi, illinois River, and illinois State canals, a further dis-tance of 385 miles to Chicago The Ohlo has a depth of \$ feet from Caire to Pittsburg, a distance of 1000

Now, since the Mississippi and its tributario even, since use anississippi and its tributaries activated injectional title a better waterway system than any in Europe, the question is asked, Why is the river and canal traffic in Surops growing faster than the railroad traffic, while in the United States railroad traffic. is rapidly increasing, and river and canal traffic falling off? One important reason is that both the municipal and private interests in Europe have provided the waterways with good terminals, and boats and barges have been developed which are specially adapted to river and canal traffic. Here, practically nothing of the

river and canal traffic. How, practically nothing of the kind has been done

As an offset to these conditions, the sovectes of larger waterway development are in favor of the con-struction of much desper waterways than any in wealth of the contraction of the contraction of much desper waterways than any in weeks to pass at through. When the government inwesti-gated this subject for the State of New York, the co-clusion was reached that the cost of transporting grain by the typical lake freighter on a deep-water canal would be 38 per cent greater than by a towboot canal would be 38 per cent greater than hy a towboat and barges on a barge canal, and it was this conclu-sion that led the State of New York to abandon tha idea of a 20-foot canal

Our contemporary is of the opinion that it would be

the very height of folip for the government of the the very neight of fully for the government of the United States, under present transportation and com-mercial conditions to spend hundreds of militons on the davelopment of inland waterways believing that the development of initials warrawys Deleving that the only way by which considerable commerce could be diverted to the present or proposed waterways would be to compel the competing railroads to raise their cristing rates on low-grade commodities and re-frain from making reductions in France the governent compels the rallways to keep their rates at i ment compress the relivarys to keep their rates at least 20 per cent higher than the rates on the competing wateranys, this practice according to the report of the Royal Commission, being based on the opinion that waterways, because of the longer duration of transport, are not abla to compets at equal rates with

OGNOTIC PRESSURE AND CURRENTS.

T is known that a current can be generated by forcing a liquid through a porcus diaphragm or filter, but such currents were too small to be of practical value. The matter has been taken up by a German scientist B Schwerin He claims to have obtained remarkable results in current prodution A liquid circulates in a tube of large diameter and at a high pressure inside the tube is placed a and at a high pressure Inside the tube Is placed a filter through which the liquid passes, constituting of a certain thickness of a porous substance contained be-tween two sheets of wire gause. The current is taken from each of the absets by a wire. To produce a cur-rent we must have the proper liquid and the filter must be specially made. Adding suitable sails to water we find a high value for the current At the must be specially much Acting attracted saint in case as many time the disubirsam much Actine among time the disubirsam much actine and must also many time the above as a function, so as to reduce the size of the poper A san example he uses a presence of 5 atmospheres for the liquid, and a layer of 100c/ prowdered carbon v, jine thick with a nursice of 32 equare laches, the internal resistance being 1000 ohms when detailled water is used But as small current is now produced, but when we add ammonia current is now produced, but when we add ammonia to the water the current is increased int times and tha electromotive force twice, therefore we have 30 times the esserty by using ammonia. The best reamonia the best reamonia the best reamonia to the best reamonia the best reamonia to the best reamonia to the best reamonia the best reamonial to the same the first pressures we could obtain large currents. When the perseaures we could obtain large currents. When the perseaures we could obtain large currents. When the perseaures we could obtain large currents. When the energy is about the same. The liquid is best sent in a closed circuit of piping

MALLEY'S COMES

HALLEY CORRY

HE first observations of the coust in the morning sky show that it is disappointingly fail. Its intrinsic light has refrectly not increased as rapidly as in the case of some other course. On the case of some other course of the case of some other course. On the case of some other course, to will be far from conspicuous to the saked ope until the little roart of life, and those who with to see it the morning sky will do well to use field ginness, and to look for a much finisher older, with the less of all, than our front page filtutiration of last weak showed.

ENGINEERING.

The Fenney/wais Railroad last wook operated the first electric train through the tunnels under Manhait an island and the Size River. The train, made up of six construction cars and an electric locomotive, ran from the station in New York to the Thompson Avenue window in Sunnyaid yard, Long island City

As inspectant link in the proposed staturary from the Lakas to the Gulf must be eliminated from esteration of that scheme, at least for the present The section referred to is known as the illinois Fire Deep Waterway, for which it was proposed that the State should spend \$30,000,000, in the extension of the Chicago drainage canal down the valley of the Illinois River The bills proposing to proceed with the contraction were defeated in a special seasion of the Illinois Legislature, which adjourned bast month

The self-year of such as a substitute as uncorreptionally bear yearing in the reduction of the scoper hits in that city. This grading, which has a lways been going on intermittently, has recently been undertaken on an ambitious scale, and nnder the present scheme over corrects million cubic yeards have been removed When the plan is completed, the total will have reached thirty-four million cubic yeards have been reached they are the plan is completed, the total will have reached thirty-four million cubic yeards The work is being done by the hydraulir situlcing mothed, and the highest covers an axes of forcy three rity blocks.

The Great Western Radiusy in England is installing a compact ralivary licked printing machine. When a stoke for a certain station is required, the clork tourbes an indicator which carries the name of the station, slips a blank into a slot, turns a handin, and the completed ticket drops out. At the same time a record of the sale is printed on a continuous strip of the sale is printed on a continuous strip of the sale is printed on a continuous strip of the sale is printed on a continuous strip of the sale is printed on a continuous strip of the sale is printed on the sale is printed on the sale is printed on a continuous strip of paper and count his cash

It is well undervioed among naval men that the speed of a vessel is affected by the depth of the water not merely in shoal pieces, but in the depth of the ways. With a view to delurnining what effect different depths of water have on speed, the Board of in spection and Burey has arranged that the standard lastion trials of three weeds abidi he made over three destroyers "field" and "Plasser" will have their rivial destroyers "field" and "Plasser" will have their rivial over three measured rills courses, one at Rockland Mains, another at Cape Cod and the third in the

The Millet articulated compound lecomonitive rout thuses to grow in favor, the reports from its committee of this type which have been some time in earlier being in general very favorable. The New York Central system has recently put its first Mallet rompound in service on the Boaton A Malay line. The present claws of heavy freight engine on that road has a maximum tractive power of 26 tons, whereas the Mallet, when working compound, has 33 tons, and when working is supplied to fine tractive power. The encoses of this type in freight service is undesputed. What realist it will give in fart passenger service thom will tell. The operation of the powerful express Mallet on the Stants For ead will be watched with great indictions.

Advices from Washington state that the chief or Bernau or Navigation of the Navy, the aid for operations, and the sid for personnel, are mapping out another extended crusics for the Atlantic Sect. At present the scheme proposes a naval review at Hampson Roods, followed by the departure of sixton ships in four divisions for Gimalar, where the divisions will separate and visit the isolalite ports on the Mediterranean. It is possible, though not decided, that the contract of t

We are indebted to Mr Frank & Taylor for the description of the new dam with which it is proposed to replace the wavehold structure across the Colorado Eliver, which was carried structure across the Colorado Eliver, which was carried study at Colorado Eliver, which was carried study of reinforced concrete, will rise as free shows low water and extend for offsets the length. The portion of the old dam which was not carried away will be incorporated in the new structure. It will be supplemented by a velofrored concrete addition, which will raise its creek eleven feet higher than the old dam. To prevent the recurrence of the secopar through the featured rock, which was so disastrous to the old structure, cortain walls two feets thick are carried down thirty rice below water, and at the bottom of the trenches holes are drilled free the feet of the property of the post of the property of the second to suppose the superior of the property as guester lock, two sillest the crevious.

ELECTRICITY.

Emmin is becoming intervated in hydro-electric power plants, and he examining into the matter of electrifying suburban divisions of its since railroads An investigation is being made of our high tension transmission systems, and it is probable that a new field will be opened for American engineers

As alsocial lighting plant in Nobraska is manufacturing loss as a hyperduct. The exhaust steam of the plant, which would otherwise go to waste is utilized in the ammonia sheepstlen process of ice manufacture and also for distilling water from which the leim made. This westure, we are informed, has proved a very profitable one for the lighting rompany, and a very profitable one for the lighting rompany, and stituted of the salvantage by other plants similarly stituted.

A new system of treating eggs so as to prevent them from growing state when in cold storage has been discovered in Rochester This constan in subscitting the eggs to an electrical current. The theory is that eggs when pieced in storage are alley and are gradually frozen to death, whereas it the life is destroyed by an electrical current before they are placed to the constant of the constant of the constant of the lectron and the constant of the constant of the content of the constant of the constant of the content of the con-

In an address recently made by Prof. John W Whitehead of Johns Hopking University it was pointed eat that out of the 230,000 miles of railroad in this count of the 230,000 miles of railroad in this country, only a thousand miles have a prie been electrified. He called attention to the fact that the electrification of the observate railroads in New York related in teressing the capacity of the reads fifty per or To be serve, the questions of electrifying subtracts, express and freight service require separate consideration had Prof. Whitehead show that his case electrification to possible and dotten that his case electrification to possible and others that his case of the
Tangeten filaments are commonly made by mixing the metal in a poster that is then certreded in the form of a filament after with the poste is expelled common for the control of the contr

The Taulor Wireless (the la making a strong prices against pile that are now before 'imagrees aiming to rottful amateur work in wir less telegraphy. Particularly oblicelomable to them is the proposed annual ree of \$100, to be exacted from all whereas nations. As there are between 4,000 and fixing the town the telegraphy in the country with their own wireless employer and five million dollars of centre, very few boys round any a \$100 few, and the result would be interprated ally all annateurs would be eliminated from whiteses experimentation. It does not seem as though the would be advisable, because many of the improvements in wheeless telegraphy have been the work of

Explosions are often reused in four mills and hreview hy nails or other iron parties that find their way in the grain, and which when they attitle the select rolls of the mills produce aparks and ignite the finoly pulserhed material about them. Recently a large matting concern that had been troubled by many which the grain is passed before Bring prepared for highest the herwiserle. All iron particles in the grain are thus pirked up by the magnots and 800 to 1,000 humbris of grain are element per bour When the magnets have collected a large amount of metal, they are swang to one side de-omergied, and swoyd clean retime. Since the installation of these magnets, there have been no explosions in the mills.

A series of tests was recently conducted for the Board of Education of Newark to determine the test form of lighting for schoolrooms. The rooms is white the experiments were tried measured 35 y 34 feet and were 12 feet high Three systems were tried medically the schoolsopewer knamp, and frested lepower graphitude diament lamps, and frosted tips. The tungsten lamps were the most economical and gave by far the best light at each desk, as was determined by illuminometer readings: A similar investigation has been made in Boston, where his target and about the side with just name the ceiling its boxes with primatel giase bottoms, which would caff the rays intel the rooms at the decired angle.

SCIENCE

According to the Journal So: Chem, it has been abown that small quantities of binmuth exert little or no influence on the chemical relation of requer and ultric acid

At a recent meeting of the Royal Society of Medicine in London, a warning was sounded against the revices use of radium. Even the reputed favorable effect or radium in the treatment of cancer were sharply criti-

The Seine is the fourth largest river in France ranking in size below the Leire, the Bhone, and the Garoune its drainage headu (30,870 square miles) is larger than that of the Susquehann (27,400 square miles) or of the Sacramento (27,100 square miles)

Sir John Murray, KCII the well known naturalist, will had an expedition for biological and physiological exportation in the North Allanus, Although much has ben done in this region an couranous field a still unexplored. Bir John sailed from Plynouth on the 14th. The sea will be explored to the depth of 1800 feet.

As a said that frow Kari Harriso of the Lairceaign of hiel has produced a synthetic rubble. The attact details of the process are not before as Attempts and as these have been one again and again but with an commercial success. The most that can be said for them is that they indicate the possibility producing a synthetic rubber from turpentine at some fature time.

De Robbia, an English willer, calls attention to the development of the jaws of Paulish have who were intens out of the street of Jandon and sent into the Prilatin have the ways introduced by the interpretary of the property of the property of the competer status and bealthy appearant as at the total issuing in the shape and expression of this force, the analyzing this, one finish that It was to be made as the property of the same of the property of the property of the property of the rations of hard ink and 'sout jank' upon which then laded by intellect

Savants from all parts of the world will gather in Josedon 1'd in xxt Augent, and will govern Mount Willows in xxt Augent, and will govern Mount Willows in xxt Augent, and will govern Mount Willows Atlants on handred leading as in this their regular sourcettion of the international minima for which regular sourcettion of the international minima for their final many parts of the state of the

power age weven applications of the bone pulse applies of the differential scalings ax no stabilists as the stabilists and all the stable the sixth and nor a gloss for either work he only disolvatings of them is the necessity of employing gloss bones for collimator and telescope which not only in rease the x-sus in the restor the instrument somewhat limited, in that the ultraviolate region of the spectrum is more or be a absorbed let explain the stable of the stability of the stability of the stable of the stability of the stability of the stable of the stability of the stable of the stability
The arkits of the tax inner smellilit at Ufranua were determined by Neccanita in 1876. At that time on spiralishle eccentricity could be certainly proved to texts in either or the country of Upsain, Sweden has re-ently problemed as discussion of the observation which have been made of these satellites size. 1884 eitherly with the great country of the country of th

PROPELLERS BRONZE OF THE EROSION

ONE EFFECT OF THE HIGH SPEED TURBINE

The introduction of high-speed turbine engines has produced a serious amount of crosion in propellers made of high tension bronzo—a material which until recently showed no serious crosion effects. The trouble which the bronze manufacturer has been chiefly occupied in preventing was corrosion both chemical and galvanic but crosion or the mechanical breaking and galvanic but resolve or the mechanical breaking up of the material by the article of the water, was formerly in we remaided. One of the most astonishin, cases of sever retrials occurred in the case of the Cunard liner Mauventails', for siter she had been in service about three months, on drydecking the ship it was found that all the brosse proposition were badly settle away, those at the storm being least were oanly eaten sway, those at the storm being west affected. The erea that suffered most was situated about two feet from the root and toward the after edge of the blade. The corroded area amounted to three or four square feet, and the metal had been eaten away in depths which varied from a quarter of

eaten away in deplus which varied from a quarter of au finch to two and a haif linches. A very thorough examination of the problem was made by Dr. Oswald Silberrad who, after an exhaus-tive series of laboratory and other experiments, detertive series or isocratory and orner experiments, occur-mined that the deterioration was due to crosion, and found that it could be prevented by the use of a special bronze alloy whose chemical and physical properties were designed specially to meet the condition

Dr Bilberrad came to the conclusion that since the material withatood the old conditions of propeller service, the primary cause of the deterioration was due to the modified conditions of higher propellor que to the modified conditions of higher propellor speed, etc. in discussing the new conditions he calls attention, first, to the terrific surface friction of the water The "Mauretania" was originally fitted with four three-hidded, hulli-up propellors, of the usual high tension bronse that has been employed for many high tension bronne that has been employed for many years for the propellers of Atlantic liners They were a little less than 17 feet in diamotor, and upon the westward vorage the average revolutions of the on stines were 174, the horse-power developed being about gines were 174, 10c norm-power developed being about \$8,000 The perimeter of each propolice trawside through the water in a holical path at a speed of about 105 miles per hour, and transmitted to the water dur-ing the whale of the vorgae no less than 17,000 horse-power "The consideration of these figures," says Dr rrad, "onables us to realise that, under s conditions, the water becomes a very rough fits for any alloy to withstand, and when the standard bronse, which has proved so serviceable in the past was sub-jected to these conditions, we can scarcely be surprised that it failed

prised that it failed."

A curious feature in the problem was the wide and
marked divergencies in the degree and position of
the deterioration in the various propellers examined
Thus in the sister ship 'Lustiania," where the condi-Trus in the stator snip 'Lustiania,' where the condi-tions were at first apparently identical, the backs of the propellers were quite as much affected as the faces Moreover, the propellars of certain destroyers showed a maximum damage at the base (see illustration) where the helical velocity is least. In lo ing for secondary causes, "dirt in the castings" v

excinded because the eroded castings proved to be exceptionally free from dirt. "galvanic action" also was shut out by the fact that analysis showed that no large concentration of copper had occurred on the eroded surface. At the same time the areas of m

eroded surface. At the same time the areas of maximum destronation do not coincide with the view that creation is alone the primary came, since these areas in no case occur at the extreme tips of the blades, where the helical volority is greatest.

After a prolonged research, involving the eramination of a large number of case of propeller destraints, it was proved that the trouble was primarity creation, although the degree to which secondary causes entered into the problem varied more widely than was anticipated.

In a series of tests to determine the relative regis



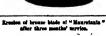
One of the new solid propellers of the "Maureiania." of special turbine alloy, which fall to abow any erosion.

tance to createn of a large number of different alloys it was found that the number of hours necessary to produce a certain deterioration varied from \$4.700 hours, the time of the regular standard bronse, to 117,300 hours for Parsons new turbine alloy, which was used to cast the new four-bladed, solid propellers with which the "Mauretania" and "Lusitania" have with which the "Mauretania" and "Lustiania" have been equipped. An examination of these propoliers, each of which weight shout twenty tons, was made after they had been running for nearly six months, by the surveyor for Gornanisecher Lloyd, who reported that be found from in perfect condition It is sig-nificant, also, that since their adoption for the for-ward, or wine abetic seek of these skips added about As the same four-bladed propellers are to be fitted to the other two antern shafts it is likely that the transatiantic speed may be raised this summer above the 20.06 average at which it now stands.

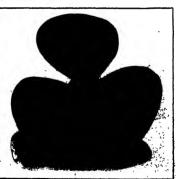
It was in 1850 that Mr. Hind read a paper before th amination of Gliefs oracibility. He discovered that his account of another comes in 1844 was so controlletory that he had no heettation whatever in preterring the Chinese statement for 1801, and concluded that the comes or 1801 was Halley's. He believed that the preceding return of the conest was in 1234, when, in July, shortly before the death of Philip Augustus, a comes was sen for eight days in the sevening willight. The Chinese annual on not mention this comes, but they Chinese annies and the revening twingst. The Chinese annies do not mention this come, but they mention comets in the years 1233 and 1234, neither of which Hind thought closely resemble Halier's Comet, Coweil and Crommelin have shown that Hind was varing about the particularly bright comet of 1251, which was unquestionably Hinley-friend to 1251, which was unquestionably Hinley-friend to 1251, which was unquestionably Hillory-friend to 1251, which was unquestionably Hillory-friend to 1251, which was unquestionably Hillory-friend to 1251, which was the particular to 1251, which was the particular to 1251, which was the same than 12

A new type of bosonactive designed to secure smokless combastion of bitumbous coal has recently been tided on two or three of the relayers entering China. The apparatus is designed to operate one the oclaims and the apparatus is designed to operate one the oclaims per an examination of the coal is so bed as to admit of the same being first consumed, those the bine finds to form mapid and incomplete combustion. Within the grates and consumed without the black smooth cutting, to sait a time if desired, from which the coal is a magazine which may be changed in coalities, to sait a time if desired, from which the coal is automatically feel to the first. A retary has underweath the first-box affords a supply of fresh air two seases through the tubes, and supplies the necessary draught. The arrangement has been used with some success in connection with stationary plants, but there of the same before the same apparat to be some absorbitem whether the fire thus appears to be some skepticism whether the fire thus produced will be of sufficient intensity for locomotive







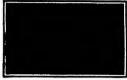


Brown propeller of a destroyer, showing presentated unidon about the first parties. Pertito of terpode-heat destroyer show-ing severe surious presion. THE RESIDENCE OF PROPERTY.

HOT-AIR SHOWER BATHS FOR VETERINARY PURPOSES

BY DR. ALFRED GRADENWITZ

Bleetrie het-air fans have been employed for some time in medical practice, and have undergone during the hast few pars most interesting alterations as re gards form and use. In their original form they were used for drying hair by means of an air current pro-duced by an electric fan, and heated by an electrical



THE ROY-AIR VESTILAYOR. A REALES-WOODD ELEC-TROSCOTOR IS RUDGED IN THE HANDLE

This current of heated air was soon found to peasees striking curative effects. In connection with maladies such as goot ris unsatism neuralists set a daily ap-plication lasting ten to fifteen minutes would allevi sie and in the case of prolonged treatment even cure these allments: It is true that the limbs affected be-

ing especially susceptible to cold after the treatment had to be carefully protected by warm clothing

had to be carefully protected by warm clothing Some time after the new treatment had been intro-duced in medicine bot-dir corrects were found to are est striking custive effects on morbid tissues and in furunculasis abscesses etc on account of the paymenta (adminators of blood) produced by the an attremoty abort time, not only in hospitals and sail toris but in the compilation froms of specialists as well as those of the ordinary practitioner. Their case of kandling the readiness of the host it has no ested with a configuration of the host it has no unstead with an ordinary contact born and the router's case of the configuration of the said the contra-tation of the configuration of the said of the con-traction of the configuration of the said of the con-traction of the configuration of the said of the con-traction of the configuration of the said of the con-traction of the configuration of the said of the con-traction of the configuration of the said of the con-traction of the configuration of the said of the con-traction of the configuration of the said of the con-traction of the configuration of the said of the con-traction of the co

greatly faillitated the shoption of the shower baths in fact both are vanilators are able to generate in half a minute a strong air corrent up to 312 degrees P a result impossible with any other apparatus The electrometrical instrument factory of DT Rich and Heilbrun in Berlin has recently acteeded the use of hotelar shower baths to reterinary practice. The ventilator used in this connection comprises a series wound electromoter hidden in the handle of the ap-paratus. The electrical indicator heating the drawn in paratus. The electrical radiator heating the drawn in air current to a temperature up to 212 degrees is car-ried by a connection tube 40 millimeters in diameter. The weight of the apparatus is about 2 pounds the current consumption of the motor under a tension of 220 voits in 02 ampere and that of the radiator 2 amperes A nickel funnel 100 millimeters in length

and 20 millimeters in diameter fitted over the mouth and so minimized in the most over the mouth place allows a hot air current of increased intensity to be generated which is particularly valuable in con-nection with a localized treatment

As does and horses are especially susceptible to



THE HOT-AIR SHOWER BATH AS OFFRATED IN

catching cold the hotair shower bath affords an of feetive means of alleviating and enving their aliments oven the most nervous dogs becoming instance to the unusual treatment after its first spill-atton net upped to

THE MICROSCOPE AS FOOD DETECTIVE

BY P. HARVEY MIDDLETON

Probably no other form of wrongdoing so ritally af fects us as tampering with our foods and meditines of course the law ellows the presence of a cretain per contage of preservatives in foods but it is the excess of this allowance that causes a continuous war to be waged between the traders and the representatives of the law. And so profitable a proceeding is the importation of inferior material into the food of the American points that many large farms employ skilled chemists at a high salary in order that their expert the content of the co

modern times the Food and Drugs Act of lune 10th 1906 and fatten on the proceeds
In what a remarkable manner our food is tampered

with may be gleaned from the fact that a large and highly trained staff of inspectors and their assistants are engaged under the I ood and Drugs A t to det et are engaged under the I ood and Druga A t to det co-offenses of this kind and great at the difficult a with which they have to contend. For instance it is a chemical task to prove that poisone us copier salis are applied to bottled vegetables to give them color and a 651418 and 113810 max on the matter of the property of the wall it; inits at 1918et declar, matter bearts a name, i fifty five letters with a le-dictipal declaration of the property of the p The alleged office oil need in saleds is off a cotton

est papper edictorated with ground off The papper stared has been append his with boths, enough the pitty sells to assess in content.

THE REPROSCUPS AS FOOD DETROTIVE.

seed oit, and such substances as burnt sugar Cayet peoper, actile other, tounin, crude cream of tartar. and French plum inter are frequently imported into broady and whisky

The term 'adulteration' when applied to food of drugs is broad in its scope, but has been given s drugs is broad in its scope, but has been given s well defined legal unaning in squreal it may be said that adulteration consists in injuriously subtracting from a substance any part of its natural or inherent qualities or adding to it any ingredient which would render the article of a different nature than that of its expressed

ful country, and seemlogly as a part of the flerce hust ness competition which hes institiously developed, this evil of food and drug adulteration has arisen. The conditions of substitution and adulteration of foods and drugs were little short of deplorable less than a and drugs were little snort or deploration feet than a detaile ago. For seventeen long years the bill which lias now become the Pure Food Law lay at the door of Congress and during all that time it was hitterly opposed by the mnufacturers who had so long onlyed unmolested their privilege of supplying the dinner ables of the nation with impure foods misles

While this not has done much good there is still a very considerable amount of adultration practised Preper adulteration is still remarkably common and "Pure White Giver Huney is cannot ted by the ind-sains of the lowy bee from glucose Other enterpris-ing manufactures will cause two grains of Cryenian peoper to grow where only one grew before by making on of the grains grow out of sawdust fround pass and beans may be found in black proper, and colory seed may be distincted with forty per cent of pow

In order to run down one class of feed faking, the od experts at Washington have introduced the pure-food experts at Washington have introduced the microscope into their work it can be readily under stood how gross adulteration may be detected by a sim pio microwope, as for instance when foreign seeds gravel, or powdered rock have been mixed with whole small spices. The adulterant may be of such a char acter as to escape the notice of the ordinary buyer, though with oven a small lens or reading gias eign aubstance may be seen to be very different from

fulness of the simple magnificr in examining food and drug mnierials, however is of little value for the examination of products which are made up of small particles such as flour, ground spices and pow In such cases r rourse must be had to the compound microscope with a magnifying power ranging from fifty to four hundred diameters

The world a supply of starch comes for the most part from a limited number of plants, twelve or fifteen part from a limited number of plants, twolve or netwer imited nearly all that are of much commercial im-portance. To the naked eye these starches all appear-as n fine white powder, but under a mit rescope grains or granules are seen which vary more or less in shape size rings nucleus and netion toward polarized light. Some of the grains are almost spherical, others are Boule of the grains are aimost, specical, others are unguith or ovoid and still others are very trregular in oulline in diameter they vary from one-tenth to one-thousandth of a millimeter. In no variety are all the starch grains of one size, but usually there are fairly well-defined limits. The way in which they sometimes vary will be seen by reference to the photographs re-produced in this srticle. Most of the grains show, more or less clearly fine lines of rings upon the surin some varieties these are arranged concentri

cally, while in others they are eccentric

"A hitem (uncleus) whose form and position varies
widely is certain species commonly occurs in starches,"
says B J Howard, who has charge of this unicroscopi work in the Bureau of Chemistry at Washingto "In some it is at the center as in corn and wheat starches, in others near one end, as in potato and ar-rowroot. When viewed in polarized light starches ahow more or less strongly a cross with the bars pass-ing through the hilum. Wheat starch has a central cross while in nuranta it is eccentric and well defined Beau starch which illustrates the leguminous type, has a spindle-shaped cross in the oat a number of starch granules are joined together forming a mass starch granules are joined together forming a mass When these masses of starch are examined under po-larized light individual grains in the mass have their own individual effect, and interfere so with each other that there results little more than a hazy glow of

By becoming familiar with these charac is possible to identify with considerable accuracy nearly all of the commercial starches Potato starch adulterated with ours starch wheat with cars flour and buckwhoat with wheat are examples of those most easily detected. One of our photographs shows a picture of points starch adulterated with a consider-able amount of corn starch. The grains of the latter are easily distinguished by their angular form

are easily distinguished by their angular form Another interesting application of the microscopic method of food analysis is found in the examination of spices. Many of these naturally vary so widely as to ash, fiber, etc., and in taste that it is impossible to

identify certain kinds of adulteration by chemical and physical means alone. A study of the structure of pure physical means alone. A study of the structure samules will usually fit the analyst to detect a tion in the ground spices as well as to identify the adulterant used. In order to work most intelligently, however it is imperative that the analyst should have however it is imperative that the analyst should have a good foundation in histological botany, since in this class of products the plant cell in its various modifica-tions becomes the means of identification. In an exam-imation of this sort nearly all kinds of plant tissue are to be considered, because some spices are derived from roots, as ginger, some from barks, as cassis and cinnsmon, some from flowers, as cloves, some from seeds, as mustard, some from fruits, as red pepper, black pepper, etc., and some, such as sage and thyme, from

"Unfortunately." says Mr Howard, "most of the substitutions used for adulteration have a structure very different from the ganuine spices For example, ough pepper may be adulterated with ground 1 or beans, it may not always be detected by che or orans, it may not arways be discored by commical means, especially when oflive pits or pepper shells have been added to counteract accessive starch present in beans A microscopical examination will reveal such adulteration at once by showing the presence of the large starch grains characteristic of certain legumes. In pepper the starch is present in angular masses made up of small grains."

It sometimes occurs that a manufacturer has added so large an amount of corn meal or foreign grou sholls and fruit stones to a popper as to make the adulteration apparent to the taste by the lack of pungency, which is often corrected by adding a small pungency, which is often corrected by adding a small amount of Cayenne paper A cophitation of this kind can be readily described by the microx opin embods of analyzis, became the tissues added are so distinctly different from normal pepper tissue I no need our photographs is abown the microscopic appearance of a sample of papper which was growly adulterated with recund cities tomes Tan starteny material has been stained black in the picture, while the party clear por-tions, more or less oblined is form, are the stone cells of the olive pits

The applicum fruits are readily identified by means of certain cells found on the inner portion of the peri-carp (pod) and others on the seed coats. These cells have characteristic ainuous outlines which make them casy to detect oven when present in vary amnii

numbers.
In offee and chorolate preparations reasted chicory,
cereals, and peas in the case of the former and starchy
materials and cocca shells in the case of the latter,
are sometimes used for adulteration. Coffee, being
the need of a gittant has a structure which is vary difforent from chicory, which is a root. The coil walls of
offee have a characteristic beaded appearance which
is present in but few other seeds. Even after reasting
and gridding theme bands can be easily distinguished while chicory contains san vessels by which it can be

Chocolate and curos are made from the seeds of the Checolate and excea are made from the seeds of the cocea plant, to which foreign starrhes are sometimes added Cocea beans contain naturally a considerable amount of starch. The grains are small in size and are easily distinguished from the starchy adulterants, are easily distinguished from the stareby adulternatic, such as corn and wheat flours or potato cera, and a rewroot starebse. An artificial checkenic coating has corn stareb. See failing and some mineral mitter, probably used as a coloring substance in the production of artificial yieldes as an assume which are considered as a coloring substance in the production of artificial yields jams, and some kinds of confections various thickeners are used among which might be sentimed golatin, starch, again-

agar gum tragacanth, and gum arabic. Some of these are difficult of identification, while others can readily be detected. Agar-agar is a product made from cer tain seaweeds, and usually contains the siliceous shelis tain seaw-seds, and usualty contains the sillivous abelia to dilations. These abelia are characteristic and quite neathy detected in the sediment from the bottom of a dish after the material has been digested with dilute nitric acid. One of our photographs shows such a distin-mencous shell tookined from a sample of artifact 'lamon sitcse' in which was found that the jellying metrial was agart-agar

Starrh can easily be detected by microchemical and microscopical tests. Gum trageaunth and some attergums of this class contain a certain amount of small starch grains. Were allowed to swell in water, a delicate imminated structure is developed by which these gums are disclosed even in such products as for even and marmaiades.

A sample of thickness for cream composed of corn starch and powdered gum trageaunth is above herein. Starch can easily be detected by microchemical and

and illustrates this feature quite extinuetorily. In this case the corn starch is shown plainly as the angular particles, while the striated bodies near the center of parties, while the striated bodies near the center of the field are swellen represents of the gum. The inter-scope is also of service in the examination of certain colles ints. Thus, if your land is dissorted in other and the latter is allowed to evaporate slowly under proper conditions, crystals of the lard Will be formed. These, if normal, will appear under the microscope as morrow plates with chiled-langual engla. Best fast treated in a similar tenance will normally crystalians out in sheaf-like turis of crystals, the ends of which are nearly or quite stoodie-like
Another application of microscopic analysis is in the

Aren, at mice

Abother apprexates or microscopic analyzas is mid-dientification of the flower from which housy is made. This is of practical value in the analysis of housy supporting to be from certain flowers. Although bees will almost invariably gather housy from sevaral kinds of flowers, sometimes one or another of these predom-inate to such an axiont as to impart a distinctive color and taste, cough to allow the honey to be called by that name By microscopic examination it is readily ascertained whether a so-called apple-blossom honey or an orange-blossom honey is really largely derived from the source claimed A photograph abowing sereral kinds of pollen found in an ordinary samp honey is reproduced

Correspondence.

THE IMPOUNTAGE OF THE BLAVES BY AND To the Editor of the SCHENTIPL AMERICAN

must file a demurrer to an impre I must file a demurrer to an impression created by the illustrated article which appeared in your issue of the 9th inst, under the heading "Ringing Chinese by Perforated Music Sheeta." In referring to Jehn McTammany as one of the inventors of the playero, I think an erroneous impress

veyed regarding McTammany's true relation to the development of the player

As a matter of fact, he is known and conceded to be As a matter of fact, he is known and conceded to be the father of the player by everyone in the plann trade familiar with the player history, and his claims to its inventorship stand unchallenged up to this moment. We do not refer to McCormick as one of the inventors of the reaper or to Howe as one of the invontors of the sewing machina nor to Cristofori as one of the inventors of the plane, although other men besides those mentioned contributed greatly to the development and improvement of the aforesid inventions

improvement of the acrossals inventions.

The listory of away great invention has demonstrated that some one man has stood out pre-eminently from all his fellows in the course of its development, and the pinyer has been no exception, and the one man who above all others stands forth pre-eminent in the player field is John McTammany, white around and about him, like so many satellites, have stood other men who have contributed of their gentus to develop and improve the invention. In the case of the reaper and improve the invention in the case of the reaper it was Mit'ormick who overshadowed all bis contem-poraries, on the other hand Howe was the presiding genius who led the sewingemechin piencers, while Cristofori was the pre-eminent genius who first con-celled and developed the plane it is true that others have improved upon the hand

work of McCormick and Howe as well as upon that of Cristofori, but nobody has been able to oliminate the elements which they introduced into their respective inventions, and so long as those essential sisments remain in their respective devices, just so long those remain in their respective services, just so long those interestings shall be attributed to the men we have mentioned. But the piano invented by Cristofori was mute and silent piano, and such it remained from the time it was invented, in 1709, until 1876, whon John McTammany breathed within its wooden walls the breath of life, and henceforth it became a living. breathing, yes, simest a human thing, until to-day it atsude forth the unsurpassed and unchallenged king stands forth the unsurpassed and unchallenged of musical instruments. The following definition the player has been accepted by the plane trade as

authoritative Thispress a smokel histranorit consisting of a easing two orbits and a service of easing the control of the cont

serverse...

The first man to embedy the foregoing sinemate for musical interness was John McYammany, and it follows that, if McCornick is the inventor of the reaper, Howe of the sewing machine, and Cristoferi of the spiral, and the serverse of the first to embody in their respective devices the essential elements which distinguished those inventous towards and the similaration of which would make them worked and the similaration of which would make them worked to the serverse of the serve Now the first man to embody the foregoing elame se carry as lars, as many year and described by the press of the country at the time, while your own files will show that Mun & Co applied for a pastent on this identical invention on behalf of McTammany on Sep-tember 7th of the same year, and prior to that nothing in the nature of the present player was known to the Patent Office or the public, either of this country or Mulicam N. Truss,

THE SOLAR AND LUNAR ECLIPSES IN MAY, 1910

BY FREDERIC R. HONEY, TRINITY COLLEGE

An examination of some of the conditions which govers the moon's motion reveals the great compless try of the inner problem. While the earth's values is nearly fifty times the moon's volume, its weight is more than eighty times—the density of the moon being only six-tenths that of the sarth. As a consequence, the common center of gravity of the two bodies is within the earth at a distance of over a thousand miles from its sur-face, and it is this point which moves in an elliptic orbit around the sun. Twice each month the earth and the moon exchange places with reference to the sun. The moon's orbit is an ellipse with the earth at one focus, and the plane of the orbit is inclined at an angle of a little over five degrees to the ecilptic. The ec-centricity is one-eighteenth, but the elliptic form is subject to great variations. The moon re-volves around the earth at an average velocity of a

volves around the earth at an average velocity of a little over five-eighths of a mile a second, but its path in space is the resultant of its motion in its orbit and of the earth's motion at a velocity of eighteen and five-tenths miles a second, illus-trated at Fig 1 The arrows A and a represent the velocities of the earth and the moon in their respective orbits. When the moon is at M, between the earth and the aun, the direction of the moon's motion is opposite that of the earth At M' the earth and the earth At M' the earth and the moon are moving in the same di rection. At these points and at any intermediate point M" or M" the moon's path is the resultant of the two motions. The plane of the moon's orbit rotates slowly tn a direction contrary to her bital motion, and the perigen has

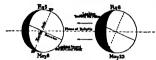
a allow motion in the same direc-tion as that of the moon While the conditions which detormine the moon's pain are com plex, observations extending over plex, observations extending over iong periods of time show regu-larity in the recurrence of eclipses. (See Scientific American, September 12th, 1908) The direction of the line of nodes is shown in the plot of the earth's orbit for November 1909 at the date of the last lunar cilipse, and also in the plot for May 1910 During the interval this line rodegrees If the positions of the

and lunar or linees in May be exceeded plotted, and the orbit magnified, the situation of the moon relalive to the ecliptic may be determined by an inspection of the plot The arrow A shows the direction of rotation of the orbit, and a that of the moon's

At the date of the solar eclipse (May 8 7 d) the p At the date of the solar x-lipse (May \$7.6) the moon's rolliur many projected on the plane of the octipute in the scattle orbit radius, and the moon's position in that part of the orbit which is below the octipute. This is shown more clearly in Fig 2, in which the orbit is magnified one bunded and sixty tinus. The moon's position is shown at Orecuvich moon from May int to the 20th, and also at the dates of the eclipses. On May 8.7 d, the date of the total ordinary of the sum, the moon will be a wind-privile to target and the sum of the sum, the moon will be a wind-privile to ratched proaching the ascending node N which will be reached between the 9th and the 10th The enlarged plot shows clearly that the moon will be below the cellptic its shadow will therefore be projected on the south-ern hemisphere The path of totality will be between sarhing the ascending node N which will be reached ween the 9th and the 16th. The enlarged plot its shadow will therefore be projected on the sounren hemispher. The path of teality will be between
latitudes 40 and 70 degrees south, and as a partial
scipes it will be viable in Australia, New Guinea,
and Java. On May 1274 d the moon will be below
the ecliptic, and will partialize the ecliptic and will be present to the state of the ecliptic and will partialize of the eclipse will be
viable in portions of Africa, southwest Emprey, North
America except, Alaka, South America, and the southerr Pacific Ocean, the ending visible in South America
and southern Pacific Ocean.

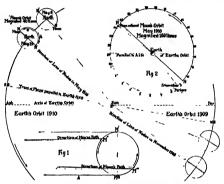
In Figs. 2 and 4 a portion of the earth's orbit in
May and the moon's orbit are drawn to the same
side, showing the projection on the plane of the south
into the ecliptic of the south of th

for each date in Fig. 2, and the curve is traced through the positions of the moon. The orbit of the moon at the date of the solar college is also shown. In the



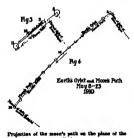
The earth during the May celin

curve of the moons path (Fig 4) there is no point of infloction, that is, it is always concare loward the aun. The earth moves about three and one-third times the diameter of the moon's orbit each day



Velocities and motions of earth and moon in their respective orbits. Smaller diagram shows the moon's orbit highly magnified

which is parallel to its axis, and perpendicular to the plane of the cellptic in those projections between the vernal equinox and the summer solution, more than one-half of the visible surface is illustrated. The



THE SOLAR AND LUNAR BULLPRES IN MAY, 1910

es show the directions in which the eclipses will

The Fast Hall of the Pature.

The principle of a mechanical delivery of mail has ten established by the highly successful use of the neumatic tube. This device is not the least conspicu

cities, and probably will be applied to a greatly ramified postal enterprise in the near future. The chief question that arises in consequence is whether a system of delivery similar to that of the pneumatic

tube can be installed for greater distances and at the same time afford an enlarged rate of speed At the present day pneumatic postal de-livery is found only in the large cities, and be-ing restricted to local business, asks a rather exorbitant price for such service. It is plain that the employment of such a mode of distrithat the employment of sun h a mode of distri-bution to distant points consequently among the titles also must give a whelly new seper-to the present systems of commercial inter-course. The first attempts made for the devi-oyment of tills lifes were those of a company formed in Paris. A recent number of Der trottochiache Anneiger states unituately the techni-

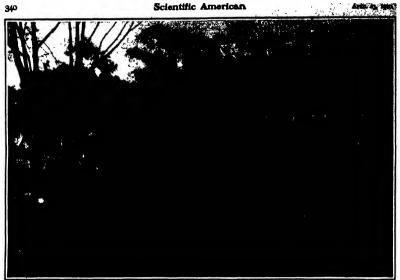
cal formation and other praces minutely the feeding cal formation and other progress of this enterprise which has reached the stage of thorough practicality, the result of the quite faths function of the experimental line in use 'but he near future the Paris com-

pany intends to connect the larger cities of France through relettic postal routes that shall not have frequent intermediate stations. The rate of speed pro-posed is 250 km (155 miles) an hony. The especity of the autohour The especity of the auto ni (25 cm yds) approximately and the weight of a load consist ing of letters and other postal pleres of smaller dimensions shall not exceed 100 pounds

The roadied so to speak, on which such delivery shall be pracwhich such delivery shall be grantled delinitely from all other means of physical rounnendstion must be lancer sellite to the means of physical rounnendstion must be lancer sellite to the control only either through no relevated road or through a union only either through an endown the control only either through a union of the control only either through a control of the contro (ross-section measures 8 sq m (95 sq yds.) For the round trip beginning at intermediate trip beginning at intermediate stations branches and switches are provided. The function of the experimental road, procured through an electric circuit, is such that the highest speed is The cars have two wheels which

reached very quickly. The cars have two wheels which run on the lower rail and size two rollers which fol run on the lower rull and sho two rollers which for low the upper rull and hold the area in position. The cars, moreover have a middle compartment for malt, and other divideous for the motors and the device used as brakes in grout and behind the body of the ears is a concles joint to diminish the reasons of the art. The frame of the tars is of tree with left. The motors are attrobed to the frame by most of kyons which awing around an axis perpendicular to the district of the state of the conclusion. to the direction of travel. The current is applied through an upper conduit and the brakes are worked through an upper conduit and the brakes are sorted by compressed air as will as by the relations of the air artificially increased by the wines attached to the sides of the front end of the cars. These wines stretch out to catch the air. This device can stop a cer within one minute and in a distance of three kilometers after the current is interrupted but is used only as an acory to prevent the too rapid destruction of wh and rails through the exclusive use of the rail brake, ource of most active friction

A patent recently granted to Carl Farkas of New A patent recently granted to ("eri Pirchas of Now York, describes a method for making incustionesett lamp metallit filaments which robolists in producing on a conducting core a highly refractory realing by decomposing in a vacuum the vapour of a sail of a highly refractory metal in the presence of vapour or yroughl, with final refuction in a vapor of hydrogen in detail, the vapours of tailorfed of chronium and pryn-gall are introduced in a vacuum containing the con-ductor, which serves as a core which latter is then heated by the passage of a current the vapors are thereby decomposed, nament carbon from the pyrugali acting as a cement thromium probably being formed When the conting has thus been produced the vapors are removed and hydrogen gas introduced, whereby the deposition is reduced to metal



Some of the little craft that competed in the racing.

MODEL MOTOR-BOAT RACING

BY H. D. JONES

Model motor-boat racing, a new sport, has caught the popular fauty in England, and is being taken up in all the large titles. With a view to encouraging owners of models to enter their boats in the various competitions, challenge cups are offered by the clubs, and the conditions are made so broad that every de signer feels that there is a chance to win a trophy signer recis that there is a chance to win a troppy The prizes are awarded for speed, for workmanship, for the general supearance of the models, for the behavior of the machinery and the performance of the beats while on the water

Not less than 5,000 spectators gathered recently at Not is than 5,000 spectators gathered recently at Chaphan Common, one of the many open paces in South Lundon, to witness the regats on the lake The competition brought to the front some of the specifiest racing models, some particularly fine one of saleon steamers, linera, and torpedo boats, and other raft that were built for appearance rather than for rating

The rules of racing were very simple Each owner started his model boat to run a straight line over the course at the end of which officials appointed for the purpose waited to "catch" the racers and return them purpose waited to "catch" the racers and return them to fish rowers. After the models were once started no interference was permitted, the ability of the unguited boat to keep in a line for the finish of the curse being part of the qualifications for prise win

Over a course measuring fifty-one yards, four bosts Over a course measuring fitty-one yards, four boosts were started in the first race, at which the accompanying pictures were taken. The best time was made by a stoum hydroplane, the "Foliy," in § 1.5 seconds, "Sunny Jim 'a gazoline eraft, did the distance in 12 bis evends, "Ladd NY," a stamer, covered it in 15 4.5 seconds, and the fourth steamer, "Idunno," in 2 seconds. in 2t seconds

in 21 seconds
On running off the final heat, boat against boat in
noirs the 'Bunny Jim' accred three wins, the "Leda
IV two whis and the "idunno" one win thus taking
first second and third prizes in the order named The prizes were allow cups. The "Folly," the fastest beat in the climbating tries, antorinately ran off, her course in the finals through her propeller fouling, and not being able to get going in the others, she had

to give her opponents a walk-over Steering troubles were responsible for many awk secretary trouves were responsible for many awar ward results in the offer races. While halled by the speciators as adding greatly to the enjoyment of the regatta, the failure of the little craft to keep their pointing and the parversity of the machinery when

left to its own resources proved sources of great disiert to its own resources proved sources or great dis-appointment to the owners of models that falled to keep a truo beadway Boats that had run as true as a die on practice spins_axhibited a tendency at the regatta to run anything hut straight, or not to run at all Gasoline motors refused to start, pumps gave ont, bollers leaked and the models exhibited a cranki ness that showed there is a lot of improvement necessary before this sport can be brought to perfection but that is why the regultas are encouraged. The weak points of the models are strengthened, and motor-boat building is benefited as the result of the lessons learned from the eccentric performances of the models in the cup races.

the inodels in the cup races.

The reliability of electric power in model regattas
was demonstrated again and again, one finely-modeled
liner, the "Fairholme," although not built for speed, liner, the "Fairholme," although not built for speed, scoring through the certainty of her performance and the untrustworthness of some of her competitors. The surprise of the meeting was the performance of a finely modeled gasoline boat, the "Silver Dart" So a finity modeled gasoline boat, the "filter Dart" for fast was this entry, that the officials stationd to catch the models at the posts could not reach her when a little of the line, and alse swered sway. Heading off down the pond, the little boat cluded a second at tempt at seture, and before she finally came to hate she had completed two round trips in brilliant it some-what erratfol fashion, to the admiration of the spe-

what erratio fashion, to the admiration of the spec-tators.

The supediency of running the regating on a tire-lar instead of a straight course is also snagsfur the attention of the superix, the difficulty of handling that is a superior of the superior of the superior of the second of the superior of the straight run serons a small pond serious accidents seem navedshiet. One beautiful model, the "florwing. Ill" after secomplish-ing several fine sprints, stoded the catchers, deaded of on a course of her even, and wound up a serior of mischierous gyrations by running that the tasks of mischierous gyrations by running that the tasks the bank, seriorally damaging ber hall and devanded by a circle of catchers standing rear install be avoided by a circle of catchers standing rear install be avoided by a circle of catchers standing rear install be avoided by a circle of catchers standing rear install be avoided by a circle of catchers standing rear install bears platified thair existence by premarking improvement and bringing unknown designers and invarious of motor-bears and motor-boat machinery so the freet. Instead of pro-lain that the standard of the standard of the con-tendard of the standard of the standard of the con-tendard of the standard of the standard of the con-tendard of the standard of the s

parison with the work of other designers, a number of men with kindred ambitions are brought together in these challengs meetings, and the test of the new at a capabilities is thorough and convincing.

The sport has progressed so far that a national challenge cup is ready for the competing designers and model owners of the United Kingdom, and the various clubs are about to hold a general meeting to draw up rules for the government of the cup regattas Naval men are especially interested in the exhibitions. At the regatta, which was the subject of the accompanying pictures, Lieutenant William Barrett, R.N., attended with a party of naval cadets and rendered many services to the committee

et of \$0,000 Candle-Power Street Lighting Plant.

BY ALTUN D ADA

As tungsten lamps require only 56 per cent as much energy as the carbon type for equal illumination, they have greatly reduced the cost per candio-power of incandescent street lighting.

What can b. done with such lighting in a sm

rusas: con b. done with such injuring in a small town is littletated by the following costs and opera-ing expenses for a plant to generate and distribute tungsten street lamps of 30,000 candis-power total. Unlike the merely nominal rating of are lamps, which are a number of times their true candis-power,

the tungsten lamps are rated at their actual mean can dispower in horizontal directions.

dispower in horizontal directions.
The capacity of 50,000 condispower is selected as merrly satisful for street. Highting in many medium and small terms, societing to the dessity of illimination required. If lamps of 46 candispower are selected the capacity named amounts to 540, and with lamps of 50 candispower the 50,000 candispower capacity will operate 350, the elicitancy being the same in either contracts of the capacity parts of the capacity and the capacity and the capacity will be some in a either capacity will be capacity and the capacity of th

With 500 of the 40-andre lamps speed 100 feet apart, or 550 of the Streamle lamps 800 feet agree, 500 feet in length of streets may be lighted much below that in sumal jamps, while ordinary reulizs may be obtained by speed and the samp 200 feet apart or the 80-andre lamps 200 feet, or 15 miles, of streets. In the full of the period and the speed a With 500 of the 40-candle lamps spaced 100 fs

This tay downed

The estimate of first cost covers a suitable plot of just, a station building of brick, concrete and steel, a sparage tank to receive patroleum by the carlond, a trust-oil engine and accessories, an electric generator. erade-oil engine and accessories, an electric generat with all necessary apparatus and instruments, po-lims on 50 000 feet of streets, circuits on these nol

) warly for each of the 40-candle lamps burned 4 000 hours, or to 031 cent per lamp hour of burning. As each 40-candle tungsten lamp operates with 50 watts, the expense of 031 cent per lamp hour, including interest, amounts to 63 cents per 4llowatt hour con sumed in the lamp

sumed in the lamp
The same conclusion is reached by considering that
at the efficiency of 125 watts per candic-power the
production of 90,000 candic-power requires the delivery
of 25,000 watts at the lamps and this
during 4000 hours amounts to 100 000
kildowatt heave, which into the annual

expense of \$6 200 gives 62 cents as bo

The Conlings Oil Bistriet, California. A report on the geology and oil to

the western part of Presso and Kings counties California by Raiph Arnold and Robert Anderson has just been pub-

Montarry 110 miles away with San Francisco Bay 200 miles away and with other points

The report describes the topography geology paleon slogy and oil in the Coalinga district which have been in part described in an earlier report published by the Survey but not now obtainable. The present report includes a more complete discussion of the district and many new maps actions and other filtus-trations besides a paper by Irving C Allen on the chemical and physical properties of the oils Man; interesting points in comection with the history of th interesting points in connection with the history of the region in past geologic ages are brought out and be means of careful descriptions of the formating a foundation is faid both for an accurate study of the occurrence of oil within this region and for the tracing of formations and oil horizons in other parts of Call

The report covers 564 pages and includes 52 plates and J text figures. The characteristic feedle of the locks of the region are fully illustrated. These afford a means of identifying particular strata from place to

same of identifying particular strate from place to c and of determining the depth and position of the oil bearing sands. Its discussions of the oil rones of the factors affecting the accumulation and the gravity of the oil of the relations of oil and water and of the origin of the oil are of broad general interest. The maps and diagrams and the wells and the character of their various products are of decidedly practical immediate value

Bulktin 198 may be obtained without at by applying to the Director of the Burvey at Washington

The Current Supplement,

the opening article of the current Britishay No 1"40 deals with circtro chemical action and boiler torrosion

The "Minnehaha" being token out for W. W. S.



and fixtures on the poles for 500 of these lamps all erected and con

those lamps all erected and con sected complete and ready to tiperate For this 20 000 candle-power plant as above with 500 lamp fixtures erected the total first cost is \$14 200

erected the total first cost is \$141,300 are 71 cents per candispower capacity giving \$22.60 per 40 candis intem This cost of plant is based on present market prices of materials labor and apparatus and assured conductary conditions at the place of excition in places as here prices and freight rate as to higher than its usual in the canter half of the United States as

is usual in the eastern half of the United States an increase of cost would result
Operating expenses of the above plant will vary with the number of lamps used even though the total candle power remains at 20 000 because of the

cost of lamp renewals and also with the hou the lamps burn yearly

All night and every night lighting to the extent of All night and every night lighting to the extent of 4000 hours per year is the most desirable and costs less per hour than lighting on moon and other sched size that run down as low as 1500 hours yearly Such all night and every night lighting is gradually lacing the short hour service and the following displaying the short, nour service and the resources of settlines of operating expenses is for lamps hursing 4000 hours per annum. With 500 street lamps of 400 andies each making up the total 20000 candle power capacity of the above plant and hurning 4000 al expense of operation would be \$6 c annu 200 including \$710 for intercat on the first cost of 200 including \$710 for internat on the first cost of \$14 (00 at 5) percent This appease of \$500 Covers all depreciation of the plant as well as the operating expenses that involve an immediate outlay of cash Apart from the interest charge "ha annual expense of operating the 500 lamps of 40 candid-power such during 4000 hours yearly is thus \$5400 The total expenses of \$500, including interest amounts to \$1340.

liabed by the United States Geological Survey as Buile

her trial

The district described which is about 15 miles wide and 50 miles long stretches along the northeast base of

the Diable Range and in cludes a band of productive oil land i miles wide and it miles long at its north end and a narrow strip of oil land along its southwestern boundary. The region includes about 650 producing wells which range in dapth from 600 to 4000 feet and practrate

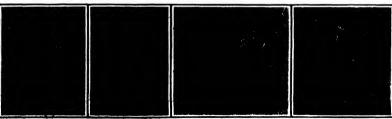
range in dapth from 500 to 4 600 feet and partrain from 20 to 300 feet of oil sand. The product rannes from a black oil of 15 dog Baumé to a green cit of 1 deg Baumé To Peidel of single wells differ a gratif ranging from 2 to 2 600 barrels a day. The clairfut is the leading producer in california and one of the most productive in the world to pro-duction in 1807 was 887123 barrels in 1804 it was 10 386 168 barrols, and in 1909 it was probably 10

0 barrels or more The total quantity of oil thus far taken from the The total quantity of oil that are taken from the ground in the district to the end of 1800 was about 63 000 000 barreis of 43 gailons each learing available a year store of oil which has been roughly estimated as a vast store of oil which has been roughly estimated as 374700000 barrels Breu if this great quantity of oil is in the ground it is not possible to state whether all of it can evar be obtained Pipe lines connect the district with the scaboard at

There is often much loos thinking and loos talking conserning the stability of examening steamers among those who ought to be better in formed than comments made sometimes seen to load sets. The matter is not represented in the stability of 'shape between the stability of 'shape between the load of the stability of 'shape between the late of the stability of 'shape between the late in its load of Trainest to Court is the title of an article in the stability of 'shape between the stability of 'shape between the late of the late of the stability of 'shape between the stability of good article on the Story many excellent photographs

The "Snany Jim ' makes a great pace.

The newspapers recently published articles on the discovery of what was pronounced to be the greatest radium vein ever discovered in the United States in i conia Lincoin Couoly Moniana Inquiry of the Geo logical Survey reveals the fact that there is very little if any truth lo the statements made



"Moratma," model of a steam

"Fairbelme," on electric liner

"Belvedere li," a gasoline model.

"Lusus," a gusoline craft. Note the

ROUGIER'S SPECTACULAR MONACO FLIGHTS

BY THE PARIS CORRESPONDENT OF THE SCIENTIFIC AMERICAN

A year ago, despite the offering of substantial prises for flights aerosa the listy of Munaco, no avi-ator made the attenuit. This year hower, and has strides lines been made in the art of flight that there are orobably a score of sylstors who are willing to

are probably a score of a lations who are willing to try a flight our water, even without any special purrange musts being, under for landing in this ele-ment in case they ore forced to do this. With the spectratules flights of Paulhan and Charles & Hamilton over the Puth Cown last January as no comple, tougher, a famous Preside cyclist and unromolities has hose latily joined the fying ranks thrilling flights above tarly last month made some

unty last manth made some thrilling flights above Monaco Hay photographs of whith we reproduce The little flight of an acroplane over Monaco Day was made on Warch 3rd Starting from the quay, Rougher described a figure cight above the bay and flew over Cape Warlio at a height of 250 feet. He landed safely at his starting point after a flight of 46 Detentes

though r's seemed flight above the bay was made on unagers seeme sight above the bay was made on the 6th utilized it the presence of the Prince of Me-hate and a targe number of speciators. This and the flight the next day were each from 5 to 10 minutes' duration. On the 7th he passed 100 feet above tha duration. On the 7th he passed 100 feet above the ilinstration, and flew

siraight across the bay, altaliding a height of 1,300 feet above Cape Mar-Despile some rather strong wind gusts the hi plane flew with steadiness and without tipping dan gerously On his way back to the starting point Rougler performed evolu Hougher performed evolu-tions above the eastmo of Monic Carlo of a height of 360 feet. Finally he flew back to the rock of Monaro and landed with precision upon the nar

On March 8th he ngalic etarted from the quay of the port, and few straight for Cape Martin, across the bay He rose to a height of 600 feet de scribed a circle obote the bay passed nyer the rocks shore al Monsco and innded at his exact start ing polot after o 10-minute flight. The next day he made his longest and most spectacular flight, starting at 5 10 P M, he se rapidly, and described a circle above the sea. Re-turning he made two more clittles above the Caston

en, still rising, he flew above Mont Egel (eleva tlon 2 625 feet) Passing over the suminit he fice to La Turble where he turned at a height of 300 feet, to LA Turbh, where he turned all a height of 300 freet, and free back to the starting ucbil. The length of this filled was 25 minutes and 15 m conds. On March of the filled was 25 minutes and 15 m conds. On March of the 15 minutes and 15 m conds. On March of the 15 minutes and 15 minutes an gree of automatic stability can be uttained by verile partitions between the main planes, and quite dis-credit the cabled report just received from France to the effect that the Volsin brothers have given up as impractical their system of inherent automatic stabil-ity, and have adopted wing warping instead

atle Naws at Home and Ale IN MOR'S VATAL ACCIDENT

sides the record flights by Rougier above Mor Bay, Le Blon, another famous automobile racing driver who has been flying a Hieriot monoplane, made a won-derful flight above the Bay of San Bebastian, Spain, on the 2nd instant lie started in a high wind, and made several circles above the bay at a height of 150 feet, when suddenly the monoplane tusped upside down, and fell into the shallow water. The intropid arvair was instantly killed Illa machine, like that of the ill-fated Delagrange was fitted with a Onome revolving cylinder motor of 50 horse-power. The ex-

essive power and the gyroscopic action of the motor vossive power and the gyroscopic action of the motor indoubtedly had something to do with both of these fatal accidents. Le Bion made a speed record of 4432 miles an hour (5 kilometers in 4 minutes 2 seconds) at the Heliopolis aviation meeting near Cairo last January

ACCIDENT TO A CUETISM RIPLANI

While flying in a Curties hiplane above San Fran while flying in a Curtiss hiplane above San Fran-ilsro Bay at Alameda, Cal, on the 5th instant Frank Johnson plunged into the water from a height of 80 feet owing to his ioning centrel of the machine Forhimself from the aeroplane (which was not badly dam aged) and to swim toward the shore. He was rescued by men in a skiff

FIRST TEST OF PARREYAL MONOPLANE

The first test of Major von Parseval's large mono-plane occurred on the 14th Instant above Lake Plau, in Gurmany This machine has a apread and length of 46 feet, and is fitted with a 130-horse-power 4-cylinder motor. The trial flights were made in a violent and gusty wind with two men in the machine. The monn. gusty wind with two men in the machine. The mono-plane capshed, and fell into the lake. That two engi-neers, Hoff and Blochman, were rescued. This ma-chine is provided with both wheels and floats, but

.

Rougier flying over the yachts in the Bay of Monace in his Votsin biplane. THE AVIATOR FLEW OVER MOST EGEL (ELEVATION SOIS FERT), AND TERLILED MONAGO FOR TWO WEEKS.

as yot. PI HILL OF THE PARRY HYPRO-AKROPLANK,

Credit for producing the first sevoplane to rise from water and fly must apparently be given to M Heart Pabre, who, according to the French poursal L'Acro, succeided in getting his combined hydroplane and enroplane to leave the water and make several flights 1,200 to 1,500 feet in longith at heights of from 6 to 10 feet he experiments were made at the Port do la Mède at Martigues, a city near Marseilles. The first successful flight from water was made on March Sist.

NEW RECORDS OF PLIGHT WITH PASSENGE

On the 5th ultimo Henry Farman broke all rec of flight with one or more passengers by carrying Mr Hevardson, of the Dally Mail, and Mme Frank for 1 Hevardson, of the Daily Mail, and Mme Frank for 1 about, 3 minutes and 25 economics. The performance was decomplished with at use and smaller hiphane than he has been in the hath of using. Just a mosth laker, on the Mt instant, Do tel Kinet, a Belgian, broke the world's record for sight with one passessor by flying 2 hours and 80 vin.ucs at Chalcon. This record was also made with a Para An smackles.

A NEW CROSS-COURTRY BECARD.

Emile Dubonnet, on April 3rd, won the 190-kilo meter (62-mile) cross-country flight prise offered by La Nature He made a fine flight from Savigny-aur-Orge to Fert-St A bin (about 68 miles) in 1 hour La Nature

RESERVE OF A PROPERLIES SHEARING IN PLICITY. While practising at Pau with his Biériot monople on the 26th altime, Leblanc had a narrow escape. He was at an estimated height of 900 feet when his pro-peller broke and flew off. Quickly stopping his motor, Leblanc skillfully glided to earth amid the cheers of the --

The Assess of Messas Rakinsky,
Three months ago, a party headed by Thomas Lioyd
for Fairlanks, Alaska, for the purpose of climbing
Mount McKinley The gaumnit was reached on April
374, after a mount of pressyd (minhig) a comparacatallished at the base of the peak in March. The
companions of Thomas Lioyd were W R. Taylor,
Charles McGonigie, and Daniel Petterson Six other
men ware also included in the party, but they cove
lett in care of the four camps established on the way
toward the top of the peak. Up to 11,000 feet the asscent was easy, but the next 4,000 feet were climbed
only by having steps out of solid fee When the 18,
600-foot leval was reached, a final push was made by
the four men named, with success. The acpedition the four men named, with success. The expedition had its inception in the violent controversy which and in inception in the violent controvery which raged whan Dr. Cook was lecturing. To sattle the point whether or not he wer climbed the mountain, and to prove that it could be done, an expedition was financed by August Peterson and William McPhee.

No trace of Dr Cook's ascent could be found on eithar of the two peaks which countitute Mount McKinley No records of his were discovered

Various estimates hava seu made of the moun tain's height. Dickey, an American prospertor, estimated it at 20. pector, estimated it at 20,-000 feet, and gave the peak its present name. Robert Dunn, who made four attempts to climb the peak, estimated its height at 20,300 feet.

Inasmuch as the present party was not properly equipped to measure the height of the mountain, its achievement is not of nuch scientific value Fortunately Prof. Her-schel C Parker of Columhia University has ex-pressed his intention of climbing the peak regard-iess of Lloyd's success. Dr Parker will approach the peak from the south-orn side, and will study the glacier and various phenomena. He will take with him scientific in ments, by the skillful use

which undoubtedly ined than could be secured by a party of four unscientific but hardy explorers.

Barril, the guide who exposed Cook, is inclined to dispute Lloyd's claim

A New Way of Lighting Mar

A New Way of Alghitug reages.

A new system of electric lighting for theater somes was tried not long since at the Imperial Opers of Berlin, and, it is attack with great aucoses. It is the investion of the Spanish engineer, Forting, and uses any lamp as the source of light. The rays of the lamp, instead of falling directly on the seens, are thrown against a series of silk bands which are un rolling and set in any contion by measure of pulsars. The series of the lamp in the content of the content The cannot serve to renect the light and change it into a perfectly diffused light. The new method also in-cludes a sky which is formed in a quarter of a sphere and composed of a steel cap which is treated with a dead white coating. The diffused light is sept into this dead white ceating. The diffused light is sent into this dome and give the Illustion of an unlimited space. Another interesting device is used to disposes with the confidency clouds which always have a rigid apparatum to the audience. These now appear to be quite plastic and mobils. Such rient is secured by the use of mirrors which reliect painted services representing the clouds. When the mirrors are rotated always, the choice appear to stowed from tore or rotated always, the choice appear to stowed from tore grant notion which was placed in the which we have the contrast of the complication of the column of t

An Automatic Projecting Lantern with Electrical Control BY JACQUES BOYER

Hitherto it has been necessary for a lecturer using lantern illustrations to employ an assistant to operate the lantern and insert each silde at the proper moment M Moulin has invented an automatic lantern (Fig. 1) which dispenses with the services of the assistant. which dispenses with the services of the assistance. The impulses mechanism which inserts and remote the sildes can be adapted to any projecting lanters and enables the iscturer, by pressing an electric state of the interest of the superiority services the teaches as is shown by Fig. 4. The pictures can be thrown on its shown by Fig. 4. The pictures can be thrown on the white wail of the class room, and if a powerful source of light is employed it will not be nocessary to darken the roots an extent sufficient to prevent the taking of notes or the use of the blackboard. The interest allows are the services of the contract of the class of the services of the servi

The lantern sildes are attached to a conveyor, com osed of two chains connected by grooved cross-bars, which pass over a skeleton drum, formed of two iron disks connected by six rods Each slide is firmly held between a fixed and a movable bar of the conveyor by

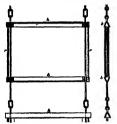


Fig 2.-Front and side views of chains carrying stide

the tension of the spring r (Fig 2). The drum is turned by a small electric motor, by means of a tau gent screw, and, as it rotates, the sildes are brought successively opposite the projecting lens

operation the flexible con voyor carrying the slides is taken up from a box behind the drum and delivered to receiving box beneath the

The motor is shunt wound, so that it can be reversed by reversing the reversed by reversing the current in the armature colls. In this way a slide which has already passed the iens can be brought back and projected again, if desired The electrical connections by means of connections by means of which the apparatus is controlled are shown diagram matically in Fig 3 Beneath the locture table is a switch I, the closure of which sends a current through the electric are A. of the projecting lantern, and also through the field cutis B of the motor, which are connected in parallel with the circuit containing the are and its rheostat On the table are two double s and s' ... ets of these connected born 1 and 1' are nor with one wire of the gen-eral circuit, the lower conand the fixed ends of the keys are connected, re-spectively, with the two sture H of the electric motor. Hence, when spetter key is depressed, both breaks are in connection with the same main wire, and no output flows

through the rotor R, which consequently, remains mo-tionless By pressing the key a, the current is sent tionless By pressing the key a, the current is sent through the retor circuit in the direction indicated by the arrows, and by rolessing a and depressing a' the current and the rotation of the motor are reversed. The incondescent lamps L and L' are bridged on the



Fig. 1 .-- An automatic projecting lantern.

keys to diminish sparking but they also serve another usoful purpose. When the key a is partially depressed, so that it does not touch either contact, the rotor circ cult is completed through the langu L, which greatly cult is completed through the langu L, which groutly increases the realistance of the cirruit, and the current flowing through the rotor is further diministration by more than one-half by the should offer to free lamp 1. Hence, the notor turns so slowly that it is an easy matter to atop the desired slide result by in front of the lens, by releasing the key a at the proper unsuff. Without the slide of the of the lens, by releasing the key a at the proper mo-ment. Veitier of these effects is produced when the ment. Nither of these effects is produced when the key of is fully depressed, because the lamp L is then short-circuited by the key and the resistance of the circuit is thus made so small that very little entrent is diverted through the other lamp. A slow more me at

of the motor and the alides in the reverse direction is similarly produced by partially depressing the key b

Tides of Beauty

The average time of high water at places on the Pa cific coast of the Central American isthmus is three hours after the moons meridian pass The average time of high water at Colon is six min-The average time of high water at Colon is six min-nies, and at Greytown one hour after the moon's mori-dian passage at Colon. In other words, as Colon and Panama are nearly on the same neridium, it may be saired that high tide will occur at the Patitic or Panama end of the Pausina Canal, on the average two hours and fifty-four infinites after high tide at the At lantle or Colon end, and high tide will occur at the Pacific or Brito and of the Maragus Canal route two hours after kigh tide at the Atlantic or Greytown end

The level of mean tide is practically the same at both ends of both of these isthmian canal routes, but at Panama the tide ranges from 10 feet above to 10 feet below mean sea level, while at Colon it only ranges from 6 or 8 inches above to 6 or 8 inches below

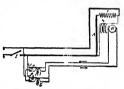


Fig 8.-Electric withing for antomotic projector.

mean sa level, and at Brito or San Juan del Sur the tide ranges in the extreme from 4 feet above to 5 feet below mean sea level, while at Greytown it ranges item than 5 Inches above and below meno sea level

than 's Inches above and below mene as a level.

Thus with a sealered canal built along either the
Nienracus or the Panama route, there would be
through currouts from the Pacific to the Atlantic at the times of high tides at the Pacific Lermini, and from

the Atlantic to the Pacific at the times of low tide at the Partie termini

In answer to the specifi question Assuming that the Pacific tide rises about 8 feet suppose II to be high tide at San Juan det Sur, Nicaragua, al noon stand ard time, what would be the approximate difference in level of the Atlantic at the same time say at Grey town Nieuragus*" it may lown Nierragus. It may be stated that at the lime of high tide at Sau Inau del Sur It is two Ionis after high tide at Grey town, and if the assumed rise of 8 feet in Sau Inau del Sur is above me on sea. level the difference in level between the two ends of the canal would in about 72

mation with reference the weather conditions Dr William Shaw Director of William Shaw Idex for di-the Meteorological Office of Great British, has been traveling in western Can-ada Wills reference to the alleged general changes in the elimate owing to the self-tement of the country. Dr Skaw is skeptical He that the people of all localities are under the impression that the climate of their district is undergoing a change. The similation do not however lane aut this idea There are oscilla-tions but no permanent changes in the climate

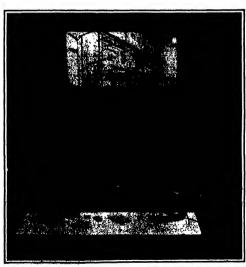


Fig. 4 .- A lecture illustrated by the automatic projector, matrolled by the lecturer himself. AN AUTOMATIC APPARATUS FOR PROJECTING PICTURES.

INSECT PESTS IN HOUSE AND STORE

HAROLD BASTIN

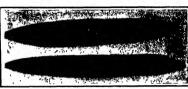
Insects as a class feed literally upon anything and veryfiling from which nourishment may be extracted everyining from which nourishment may be extracted by dut of strong jaws backed up by equally strong digestions. A substance may be bone dry, almost as hard as rock and in every way uninviting, yet so everything from which nour

iong as its origin is traccable to the animal or vigetable kingdom at least one in an probably very many kinds one in our probably very many kinds will and in it the wherewithal of evening. And because they are omnition in in the full sit seems of the word, in our rank as the worst peats with which civilized man has to contend whither his calling be that of a pro whether his calling be that of a pro-direct or a disseminator of the neces-surios and inxuries of life. Much has been written respecting the depreda-tions of insects. Everyone will prob-

tions of Insects Everyone will prob-sible know something at least of the tax-which has been imposed upon the ex-chequer of this country by such insects as the 'colorado beetle and the "scale" of the orange groves But it is with certain posts which while less devestating in their activities, affect closely the individual comfort of our readers that the writer proposes briefly to deal in this place. Probthe writer proposed orient to done in this piace. Probably few people realize what a number of insact peats are to be found in the ordinary house or larder. In secta penetrate the vary fabric or our dwelfing places—that is, so far as the woodwork is concerned. They burrow into our furniture and our books and con unic by slow degrees the very carpets on our floors and the clothing in our closets and presses

Among the most widely distributed of these domes Among the most widely distributed of these domes-tic posts are certain tup besting of the genus Anoltum Their ancestral home was in the woods and iance where they are still abundantly represented, frequent ing the doad branches of trees and shrubs. They have, however forced an entry into almost every old house in the land, as well as into many a modern described by both and a well as into many a modern described by boring into and consuming furniture, beams and woodwork in general. This successful assault of our houses must have been accomplished many conturies bouses must have been accumplished many centuries age, for one of the commonest species was divided 'dons sifess' by the old naturalists and is so called at the present of a This insect is barely one-sized of at inch in length, gray brown in color, cylindrical hape, with its head hidden in, or overbung by the thorax. The they grains are not-bodied, with hard brads and—as their work bears witness—powerful jaws It is not difficult to dotes the presence of these grubs in woodwork Suppose that you have a valuable Chippendale chair, and that you notice beneath it upon the floor, certain little heaps of yellowish dust insuction of the chair itself reveals minute holes

as though the piece of familiare had been "peppared" from a distance with a charge of dust-shot. These signs are indisputable evidence that your chair is the standard and unless by some means you can



contrive to dislodge the peats, they will slowly but surely reduce the woodwork to dust and chips When once a piece of furniture is assailed by Ano-bium, it is a very difficult matter to cradicate the peat. Several mothods have been suggested One plan is to place the piece of furniture in a refrigeration



Dust from the borings of the cork-caterpillar on



for a week or two, and thus attempt to kill the beetles and their grubs by cold. It is somewhat doubtful, however, whethor even this soreer ordeal will destroy all the beetles. Another way, and probably a more effectual one, is to place the furniture—first taking it to ploces if necessary—in a hot chamber or oven, and there bake it for twenty four hours or more

temperature be kept h little above that of Soffing water, not a single bestle will be alive when the Sub-lag is over. Often it would be impossible to addy either of these methods, and is such cases the best plan is first to place the piece of furniture in a very

o place the piece of turniture in a very het roum for some hours, these to in-ject, by means of a very fine-mose syrings, a perfonence light—such as crecoste or cyanife of potassium—fine as many of the tiny "norm beles" as can be found on the surthes. Then tr-move the furniture at once to a cold place, when the sudden change of ten-preture will cause the potenous femmes to be drawn into the innermost reholes on the surface should be st up with paraffin wax

up with parafin wax
The various species of Anobiese, and
their biguer relatives of the games

Ketolovies, by no means confine their

Ketolovies, by no means of the means

work of old houses has been so completely riddled by
their borings as to render the structures unants. Indeed, a beam that has been tennated by these insects for a number of years is little better than an outer for a number of years is little sourcer tann an owner shell containing a mass of wooddust. A photograph showing damage done to woodwork is here reproduced *X*siobisas*, by the way, is the common "death-watch," while *Anobisas* also is in the habit of making a tap-ping sound. The nocturnal tapping of these insects, while Asobiess also is in the habit of making a tapplus sound. The nocturnal tapping of these insects,
distinctly audible in a room where there is an otherwise complete abence of noise, has for many contrace been regarded by the superstitions as a warning
of the approach of death. This uncanny interpretation of a mysterious sound is searedly surprising when
been found in some seculated spot, priving its hard
been found in some seculated spot, priving its hard
been found in some seculated spot, priving its hard
been found in some seculated spot, priving its hard
been found of the some seculated spot, priving its
hard alterograph intervals upon the surface of the wood
beneath it. Bo far as can be told, its rappings constitute a kind of courship ritual. Obviously they have
no connection with the latter end of mankind 80 that
he old "death-watch" theory has been exploded?

While speaking of these bettles, the writer may
mention another laseck thaves as the "book-loons." It
of sale suber, while it is not distantly related to the
"white saits" of fropical countries Airopse defenfories, to give the book loons is actentific name, is very
common in old houses, especially if they are donn
As its popular name indicates, it may be found among
all books and manneripts, where it seems to browse
upon the surface of the paper it has also been
(Continued on paper 45c.)



In apple (cut in haires) which has been the home of a



Ginger root situeked by the pasts



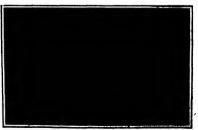
Olganuties demagned by the tobacco



A book showing the ravages of the



Old Java softes beam showing the borings of



Managed estacked for the made heads. DESCRIPTION IN HOUSE AND STORM.



Grains of whom imperiors) which has



PERSPROSE CONSTRUCTION AND OUR ANNUAL FIRE LOSS

It is esti d that our annual fire loss and the it is estimated that our annual are loss, and the sum expended for fire protection, etc., represent an annual sum that is approximately equal to the cost of building the Panema Canal The public is awakesing to the

nim16 cance of this fact, and business men and business men generally are bo-ginning to realise that the best way to guard themselves against the fire peril is, not so extinguishing fires and burden themseives with heavy insurance, as to so srect their buildings that it will be difficult for a seri ous fire to origi-nate, and, if it does, impossible



Applying the plaster to a rib-stiffened steel lath and pla

both the ribs and the fath being made from the same shoot of steel. The object of the ribs is to give suffi-cient stiffness and rigidity to the fath, so that when elent stiffness and rigidity to the min, so that were used in walls and partitions no atude, such as are required by the ordinary plain lath, will be neces-sary. When it is used as reinforcement for floor and mary When it is used as relatorcoment for floor and roof slabs, no wood centering or falsework in rougher for the ribs give the required different fitties and for partitions, it is morely necessary to provide a fastening at the floor and th necessary to provide a matering at the floor and the elling. The sheets are then sot in place and the daster applied directly to both sides. For sidings of factories and similar one and two-tory buildings, a framework of steel or concrete is



Daikling a roof of reinforced concrete construction.

FIRE-PROOF CONSTRUCTION

ous hold upon huliding The growth in favor of fireproof con the huliding struction has been indirectly stimulated by the growing price of lumber, the advance having been so great that for some forms of construction there is but little extra initial cost involved in putting up strictly firepro construction. Indeed, from an investment standpoint it can be demonstrated that the freprent hullding is the only really occumient building. The saving in the cost of insurance, reduction in depreciation

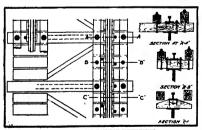
the cost of insurance, reduction in depreciation charges, the guarantee sensint interruption of business by fire, combine to make an unburrable building the cheapest in the long run.

The phenomenal development in reinforced concrete construction must be regarded as one of the most significant movements in the bread field of architecture and engineering It is not too much to claim that the item's abare of improvements in this direvilon is to be credited to American engineers. to be credited to American engineers. The experi-mental work on sample structural members, and este-cially upon beams and columns, has led to a pretty thorough knowledge of the irre principles of con-struction to be adopted for reinforced concrete when used in such members, and the introduction of a reinforcement designed to adequately take up the basering strains, as supplied for instance in the Kaila system, has made it possible to produce beams, gird ers, stringers, and other members subject to bending provided to which the sheets are attached. Lines of supports are provided, about six fret apart and the ity Rih is properly fastened to them. The framework is similar to that which would be provided where the ordinary wood sheathing or corrugated iron is used, except that the girts can be placed a greater distance apart. When the steel has been properly placed a special stucce plaster is applied in two roats Whore the system is used in connection with floors

and roofs, supports are ordinarily provided about five fast apart. The sheets are laid directly over the sup-ports with the lath face downward. All that is necessary to complete the work is to put in the controls on the upper sides of the sheets to the required list ness. Only a sufficient amount of rom rete will flow through to give a thorough clinch on the steel. This leaves a roughened surface on the underside, which provides a satisfactory key for the plaster applied on the relling below By use of reinforcing materials similar to this, nearly every type of bnilding no mut ter how small, may be built fireproof at a cost very little greater than the ordinary wood framing

IMPROVED BLEVATED BAILWAY CONSTRUCTION The combination cross tie and "block" in construc-tion shown in the accompanying drawing has for its object to reduce the noise of elevated railroads and

no of elevated railroads and increase the light to the atreet below. An open con-struction is provided yet the rails have an almost the rails have an almost continuous support white tends to absorb and step the vibration sent out from the rails. Bost of the noise from o train on an ok vated from o train on an un voca-structure is due to the pas-sage of the whoels over the rail joints and there is no doubt that this noise is sage of the where over two religions and there is no doubt that this noise is intended by the inefficient support of the rails at usels. Should the three blooms to be relied over the rail, the vibration of the resource of the inserting which is the support in the support is made the noise over the rail, the vibration of the resource of the inserting which is not support is made the noise is reduced to a maintain it is but natural for engineers on copy precedents, and for this reason the usual system of cross loss, which, by a process of ovolution, has been facilies.



· DEPROVED ELEVATED BAILWAY CONSTRUCTION

orth can be determined with de-

present, whose strength call be uncreased probable accretively.

Side by side with the development of reinforced concepts members, such as ore suitable to what night be called the thicketon frame of concrete britishing, anythology of the control of the bred open carriace represented by the secondary general control of the control of the force and the control of th

which, by a process of ovolution, has been found most satisfactory for a road constructed on the ground most existancery for a road constructed on the ground has been adopted for elevated railroads, with the result that an excessive amount of noise in produced when-ever a taxin passes over the rails, and the street is en-necessarily darkened by the multiplicity of cross the Talls proposed system of building an elevated railroad has been suggested by Mr Carl E. Kiek, of 1245 Colum-bla Avanas, Chicago, III.

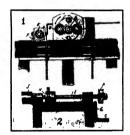
ATTACHMENT FOR WOODWORKING MACRISES.

The accompanying engraving illustrates an attach ment for woodworking machines generally known as mulders or stickers used in such and door factories for cutting rabbets and moldings in the parts to receive the panels. When a door is to be provided with a pane of glass, it is usually necessary to cut away the molding or rabbet at one side so that the glass can be inserted when the door is completed and be held in position in the usual manner by means of outty In r io avoid a second on ration to cut away the m ing for this nurpose the auxiliary entier shown in the accompanying cograving is provided. The auxil-lary cutter is arranged to be moved axially into and

ont of operative position, so that whom it is no longor desired to cut away lin molding the operation of the auxiliary cut ter can be stopped in Fig. 1, which shows a face view of the morbine the main shafi la shown at 4 and main head, provided with the coilers B which form the rabbet and mold ing immediately In front of the entter hend is a table on while it the

work is supported and a pair of guides D for holding the work in posi tion. The auxiliary cutter is mounted on a shaft F. It consists preferably of a square enter head provided with a pair of hisdes F. Fig. 2 shows a side view of auxiliary ruther moved to inoperative position so the authory there is mapped on the table that it is lears the work if supported on the table to.

The shart of the auxiliary entire is provided with a yoke and collar if by which it may be moved axially so as to bring the utter tuto engagement with the



ATTACHMENT FOR WOODWORKING MACRINES

work G The driving pulley of the shaft E is sh Inwator of this attachment is Mr A C Pippett of 1283 Franklin Avenue Astoria Oregon

SHAFT COUPLING

Pictured in the accompanying engraving is an improved coupling of the type adapted for connecting the abutting ends of two recombine shafts. Briefly the device consists of a key and o sie we which writes to hold the key in place white a second looking key serves to retain the slesse in position over the two shafts As shown more charge in pantion were the year.

Fig 2 and in Fig 5, a keyway is sut in each shaft and a pit ur revess is formed at the end of the keyway. The shafts are inread so that the two key and a pit tree to the second of the tree and second of the tree and second of the seco keyways Before hringing the shaffs together, a aircoid listed over one of them. This sleeve as shown in the cross-sectional view, Fig. 1 is formed with a keyway adapted to fit over the ky A when it is moved over the abutting ends of the shafts. To hotel the sleeve in position, the key D is used. This disthe severe in position, the key B is used. This his linto an exterior keyway in the sleeve C and is provided with a pair of lugs E which pass through the sleeve and into the two shafts. A serve F serves to hold the key B to the sleeve C in this maconer through the two shafts are rigidity connected. Owing to the large

diameter and massive construction of the sleevs O and owing to the manner in which the two keys are interiorked the coupling has a ser math qual to the of any portion of other shart. Who the shafts are coupled they are in 11 in alignm if with each and it is impossible to turn on shift relatively to the other as print a free sufficient to milled them to a considerable at m. A pant on this coupling has



A STRANG SWART COMPLIES

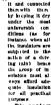
t n secur 1 ly M: William F liaum of 2302 Gedar Street i biladeli bia Fa

A NEW SYSTEM FOR RIGH TRUSION INSULATION

A just at a cently less d to Leuis Stellab right of Brooklyn N Y covers a novel and improved system of insulation for high jointial electric conductors to be used in various relations and for various purpos such us now r transmission and for guy with a or ca-bles on ployed as stave for towers or poles masts and other supports used in wireless telegraphy and and that appoint as the regular commercial work 1: marks a radical dejusture in the development of in sulator systems
The system onspichends a serie of insulators pro

ine yasum onipicimena a acri a or insutators pre-ferably of a thimble type and a acii so other insu-ators of a rod (s); the thimble type i rautators being attitude. With the rod tyj insulators and dogst br therewith forming a lixible chiln of parts which may be extended indefinitely.

of course at all times comparatively dry Lach thin bi type insulator acts like an umbrula cov vering the upp : end of the rod type insulator below



This system will practically prevent loakage and undestrable grounding of the current other from conductors from supp II & stru tures for

in this system the various parts nay be readily detached and re ilsicd by other parts and the total number of parts may be in creased or dim inished at will

after the original structure is built this feature being after the original structure is built this feature being specially uncorient in instances where after the in-stallation of a note me the votings in to be increased in the control of a note in the voting in the increased in the control of a note of the control of a note that the after time as a whole when it special in the medium of the con-sistent medium beauting in a classification of the parties to show the robe bounding, it is there addition you that the complete situature is relief at a limit of its parties as will as in the constitutive from the factor of suchdess and abrupt accidental strains usually so destructive to mechanism of this kind

A NEW STRUM OF HIGH-TERSION INSULATION

STRIPLE LETTER SCALE.

An investor has recently arrived upon the simple idea of using coins to weigh letters, so that the value of the coin will represent the value of the stamp that must be applied to the letter A simple beam scale is used provided at one and with a clip for bolding the latter and at the other end with a clip for bolding the recent in the scale in to be used for States and mail the rates for which are two cents an ounce the mait the rates for which are two cents an ounce to fuicrum of the sale is so placed that a letter weighting an ounce would be just counterbalanced by two one-cant coins in the other city. As shown in our filtu-tration the scale beam is made of sheet metal beat to channel form with the ends turned over and termin to channel form with the chart turned over and termine sting in kink daged privots on which the letter and coin cities are suspended. A dotail of one of these clips it shown in Fig 2. It is made of a single piece of metal bent to form two jaws which may be roughened or crimped to provide a better gripping surface. At the upper and of the clip are two cars bent upward and the upper and of the clip are two cars bent upward and provided with apertures to recket the pivots of the sisk beam. A half-shaped handlo serves as a fulcrum for the scale. In order to adjust the saids sourch as a substant point is provided on the under side of the wait beam. The scale beam is formed of two scale beam. The scale beam is formed of two scale beam the ket upon it to hold it in place as indicated in bethe upon it to hold it in place as indicated in the ket upon it to hold it in place as indicated in the scale to a correct balance. The inventor of this input low letter scale is a correct balance. The inventor of this product of the scale to a correct balance. The inventor of this product is contribated as the scale to a correct balance. The formation of the Schrift hadron. uth Dakota

IMLET VALVE AND SCREEN FOR PURPS.

The device which is illustrated in the accompanying engraving is adapted particularly for use in con-



SIMPLE LETTER SCALE

nection with water pumps in boats the object being nction with water pumps in boats the object being to strain the water that is drawn in by the pump. It strainer is provided with a special attachment whereby it may be ci ansed instantly while the valve is in sorvice. The body of the valve is indicated at A in the sorvice. The body of the varies is indicated at A in the illustrations and is provided with a branch B whereby it may be connected with the pump. The lower portion of the body is enlarged to form a valve, cap. C Serewed to the case is an extrasion member D which at it is owner of the found with a series B A valve seat plate F is severed in the chamber O and upon it reads the valve O it use B in the top of the chamber O and the valve O it use B in the top of the chamber O reading controlly through the valve O it use B in the chamber in the valve O it used in the chamber in the valve O it used in the valve O it will be a series of Passing controlly through the valve O it fitted with a pair of blades A. These are adapted to be pressed against the outer



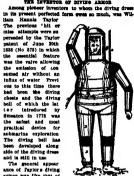
DELET VALVE AND MEASUR FOR PURPL

surface of the server B under tension of a coil spring L. By rotating the rod J the blades E are caused to scrape the screen B, and thus remove any dirt that might clog the openings of the screen. He Olof E, Lillyman, of Potlatch, feahs, has just secured a pattern on this improved inlet valve and screen

THE INVESTOR OF DIVISO ARMOR

the essential feature was the valve allowing the emission of con-sumed air without an influx of water Previ ous to this time there had been the diving chests and the diving bell of which the lat ter introduced by Smeaton in 1778 was the safest and most practical device for aubmarine exploration authorine exploration The diving bell has been developed along aide of the diving dress and is still in use

The general appear ance of Paylors diving armor was like that of a knight s suit of mail

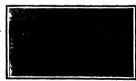


PERST DIVING ARMOR.

except for a prominent buige in the body piece A large pipe com Dulke in the body piece A large pipe coming down from the surface and penetrating the body piece at the bulge supplied the fresh air while a short pipe entered the body piece on the other side and was provided with a valve which carried off the exwas provided with a valve which carried off the ex-haust Although diving armor has now reached its irricated state this valve has nover been materially improved upon The acompanying illustration is re-produced from Mr Taylors patent

AW IMPROVED TORAGOD PIPE.

The principal objection to a tobacco pipe as every maker knows lies in the fact that alcoting accumu smaker knows nees in the size that into me account interest as met an extent as to partially clog the stem and detached particles of the distanted drug are apt to be drawn into the mouth. The saliva is also apt to flow into the stem and collect there. To obviate apt to fow lato the stem and collect there 'To obviate three disagraciable feature of the ordinary stem million and the notion have been made designed to trap the saliva and the nitroilier. The ecompanying ongraving the interest one of the latest farentions along this line. The pipe how its provided with two openings on above the other and these are adapted to communicate with two channels in the stem. The stem is provided with a core piece in which the channels are formed. The core is indicated in the rore such corner to the core is indicated in the rore such control the provided with a core piece in which the channels are formed. The core is indicated in the rore such control the provided with a core piece in which the channels are formed. The core is indicated in the rore such control the provided with a core piece in which the channels are formed. Fig 1 The upper channel extends the full length of the core and through this the amoke is drawn Near the inner end of the stem the core is provided Pir 1 Near the inner and of the stem the core is provided with several duels extending downwardly and rear wardly to the lower channel of the core so that any nicotine or solid and liquid particles drawn up with the smoke will be trapped by the ducts and will acon



AN IMPROVED TORAGO POPE.

mulate in the lower channel. It will be observed that the lower channel does not extend the full length of the core, so that it is impossible to draw any of the nicetine late the most in the core a channel for formed in the bottem of the core a channel are formed in the bottem of the core piece which communicates with the smoke observed in the communicate with the mosts dehensied mark the smoothpleer. This serves to trap the nailty has may enter the smooth channel. The stype of the mark the contract of th d pipe is Mr George Bradley, of 918 Ib Stokens, Want.

PART PATERTING INVENTIONS.

April 23, 1910.	Scientific	American	347
RECEIPTLY PATRETED INVESTIGAT.	Hardware and Took.	Townsend, Munt This machine affords a pred	nected to the composite people rather had no
Partnining to Apparel. GARMENT RACK.—G M. Vall. New York.	STENCILING AND MARKING POT T F ANDRONS, New York, N Y This pot is for	Townsend, blunt. This machine affords a post- tive manually controlled feed for the drill, and facilitate its withdrawal from a hored sob- when desired, and also provides a limble means	nected to the composite popular the last ma- bers overbaping on another, and a fewal so parted upon the last membered members
GARMENT BACK.—G M. Vall. New York, § Y. This investion refers more particularly to a rack which can be folded into a compa- torm, which has hooks for use in supporting		when desired, and also provides a liable means for detachaldy securing the drilling machine	North topics of any of these patents at he furnished by Munn A to for the cents ess
orm, which has books for use in supporting	structed that the ink can be easily taken up upon a brush or other device used in stanciling	for detachaldy security the drilling machine upon an object that is stallousty or has saf- fecton weight to afford proper support to the machine when in use	Please state the term of the patentes title the tovention and date of this paper
term, which has known for use in supporting paraments and like articles, and can be ar- ranged in a piscellity of positions, operative and inoperative, and which includes suitable seems for supporting the rack from a nail or health.	use is holding lake and ribt." substances which can be easily manipulated, which is no even structed that the ink can be easily taken up upon a brank not other device used in steadiling and marking in pathing, and for other pur- poses in which the lake its prevented from softling and which has means for freeling the brank from zeroes quantities of lak	machine when in use	
nd insperalise, and which includes suffance seams for supporting the rack from a nall or	settling and which has means for freeing the	STATION INDICATION -F h HARRIN Ca mandalgua N Y The indicator to intended for use in passenger cars or other vehicle for indicating the next station at which the	Legal Notices
	brain from recons quantities of ink FRRIRBMANA'S NIKEDIAR—W J Max, New Orleans, La. The object hore is to produce a needle such as used by flathermore for requiring users and actions and having a special countries too including a knife while can be readily operated when desired. Tuder normal conditions the edge of the limit does not prestrated from the lodge of the limit does not prestrated from the lodge of the limit does not prestrated.	for indicating the next station at which the	DATENTO
Electrical Bovices, THERMO-ELECTRIC FIRE-ALARM — G	Orionna, I.a. The object here is to produce a needle such as used by dahermen for renairing	for indicating the maximalion at which the or or which is in sing. More particularly are or which is in sing. More particularly indicating the single single single single single indication on which there is provided a long and or works harden the many of the one country performs to riew. A Casawook Waynowship in This matchin is for use in Waynowship in This matchin is for use in Waynowship in the single single single single single in rough all single in the long to the single force or properly guide or hold the single force to the single sing	PATENTS
LACKHALL, Toronto, Canada This siarm is	nets and seines and having a special construc-	indicator in which there to provided a long band or curtain learing the manus of the soc	INVENTORS are taylind to communicate wit
THERMO-ELECTRIC FUSE-ALARM — G HALLEREALD, Provesto, Canada This asiarm is specially useful to belidings, such as far-iories or wavebousses, for the purpose of giving as larm in case of fire. It is also introded to be seed in the holds of abliga or in other features where a local rise in respectively day be stillined to indicate the cataloner of	operated when desired. I inder normal condi-	cessive stations and movable to bring and resulve portions to view	INVENTURE are invited in communicate wit Muan & Co., 361 Brondway, New York, o 643 F Street Washington, H. C., or repar to septing valid patent perfection for their in
larms to came of fire. It is also intended to be seed in the holds of ships or in other	from the body of the needle so that the blade	WHIF FRUE & MACHINE -D A CLAWSON	in securing valid patent percetter for their in ventions Trade-Varia and Capyrish registered Design Patents and Farrigo
ilustions where a local rise in temperature say he utilized to indicate the existence of	to held in an inoperative position VALVE OR FAUCET E P McCollon,	making wire fences in the field and arranged	
TO CARROLL AND COMMON AND WAR	VALVE OR FAUCET—E P McCOMON, Baltimore Md. This device is intended more particularly for embodinents in faucet a used in connection with a filer the instrom of which seats on the chambered top of the faucet. Fac- ration is the faucet coacts with a now, in	for ready attachined to the line wirs of the	FRENCH recurred A Free stipation as to the probable patents bility of an ierculion will be readily given to an law stor furnishing as with a model or related as a brief description of the device in question. A committed ions are strictly resided and or Branch-Book on Plautic will be sent free o
CARBURETER AND CONTROLLER FOR MYKHINAI-COMBUSTION ENGINEE.—J L. ATE, Jersey Cily, N J in the present patent he invention is particularly applicable to spense in which an internal combustion engine	in connection with a filter the lettom of which seals on the chambered top of the fauret. The	while attacting the same to the line wires, and to permit ready attachment of the mit	a brief description of the desires to question. A
he invention is particularly applicable to sys-	valve in the faucet courts with a novel ar	and to permit ready affactment of the roi chine to the time where to allow the operator to accurately faster the sixth in proper ver- tical position to the line wires	Hand-Book on Palents will be sent free o
ems in which an internal combustion engine a employed for driving a generator and the	rangement of ports and passenges for directing the water from the supply pips through the ditor or macely against the bottom of the filter tu wash the same and then directly through	tical position to the line wires	there is the Oldest agency for accuring patents it was established over sixty five rears age.
see in which me internal community of the semployed for driving a generator and the strent from the generator is used for operat- ng a motor or for doing any other suitable sees of work. Nuch a system is illustrated in	tu wash the same and then directly through	KEG RINNER — \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \	
orse of work. Much a system is illustrated in prior application for a patent filed by Mr hale	to cut off the supply pipe and drain the fifter	conduit having a nossle and a controlling tairs a fool lever operable to simultaneously	MUNN & CO , 361 Broadway, New Yor Branch Office 828 F & Washington, D C
ale		project the much valve into the keg and open the valve and rollers to someout the keg over	
SLECTRIC ("UT-OUT P T McNatty landam, N D The invention relates in de	in a device to be used in affaing stamps or	the notale each roller invering toward the	INDEX OF INVENTION
ELECTRIC CUT-OUT P T McNarry kandan, N D The invention relates in de- leves for operating at a distance, electric witches in branch lines of electric circulta	One object of the invention is to provide a de-	movement to rigring position	For which Letters Patent of the
	WYMP AND LABEL AFFILTS—G E- LAWY Laming, Mich. The invention pertains in a device to be need in adhaing stamps or labels to jetters or articless of snanufacture One object of the invention is to previde a de- vice which will automatically grips a label stamp and dispose it in proper rigition on the surface to which it is to be officed.	I LIBITE VILNE ATTACHMENT FOR WIND INCIMENTAL SERVICE OF THE	United States were issued
del bytach lines either from the power house and bytach lines either from the power house or any remote station thus controlling the introduced maid branch lines williest cutting of the current in the main line leads.	surface to which it is to be affined.	ING MCHINES - B. BROADERS New York N.Y. The invention relates to applying a link control of the like in is low sound unless agond butchin or spitchle. The nilject is to apply it to the thread after it is	for the Week Ending
errent on mid hranch lines willies cutting. If the current in the main line leads.	from and Damper openation J	sound only a speed leads in or spindle. The	April 12, 1910.
TPI BORAPU INSTRUMENT - W McL	improvement in dear and damper operators and the object is to provide a spring operated	nomal on the leablin or the like the interienti	AND BACH BEARING THAT DA
ACRRON, thanjonia, N. C. The main object ere is to provide means whereby the dulu- rables are used in the ordinary Morse to le- traph code, may be made by the single pressure	mention normally restrained from setton for	normal on the lashin or the like the interioral preferalds being in solid form and held against the sides of the several windings on the holdin	(See note at cust of list about reques of these pate)
raph code, may be made by the single pressure	and the object is to provide a spring operated makinds mormally restrained from action for opening and closing, the dampers and doors of a furnace oc the like at n predetermined this with a mechanism is released by a clock move		Absorbed retractor 1 Species 95 Abresity besterial usel making 11 1
of a key, the reby fluing away with the sinceals:	ment.	MCAIR. A P Intracting Circland Dhia The invention provides a scale having a pour- ing attachment to deliver only when the curp	Abrardit material used making 1/4 Paramater material used making 1/4 Paramater to search aspects to the following an paramater following to be followed by the following t
ontinued use of the movement causes the	Heating and Lighting.	lack is in receiving position, a pouring	Advertising derive A Market MAN
raph code, may be made by the single presenter of a key, the risky duding away with the staceasts intremed of the finger of the operator. Long onthurd use of the movement causes the inger and band of the operator to become astigued and ofton results to telegraphics! a ralysis.	WATPH HEATER - J W Hanne Sourlake, Texas This device in far use for heating ford	lack is in reciving position, a positing attachment minstahle alsere ilu seste pist form a lesking siturburui ber ile seste besu	Abdominal retractor J. Sparce. OS. Abdominal retraited and making 11 by terceith apparatus Hapitingan W. Gursjan Bal- terceith apparatus Hapitingan W. Gursjan Bal- terceith apparatus Hapitingan V. Gursjan Bal- terceith apparatus Hapitingan V. Gursjan Bal- terceith apparatus Hapitingan V. Gursjan Bal- terceith apparatus Hapitingan I. 1 feet with the retraining the Fall V. Interest the Marie Marie Marie M. Hapitingan Sparce Hapitingan Marie Marie Marie M. Hapitingan Sparce Hapitingan Marie Marie Marie M. Hapitingan Sparce Hapitingan Marie Marie Marie Marie M. Hapitingan Sparce Hapitingan Marie M
		to prevent the flow from the pouring device except maker conditions a pouring discipance	Affairs mills freely for W. Arks. Manuform and Distribute composition of
Of Interest to Farmers,	The invention has reference to improvements in feed water besters and has for its object	atta humen adjustable above the wate plate form a to king attachment for the wate beam form at the first and the second second to the target multi-conditions a poserior, it is more to beautile plants and the materials with open openings and an its tribuils opening and an interface with open openings and an its tribuils opening at the pouring style, when the desired weight has been obtained.	dars Alternative and Literature and make
and, Wis in this case the sim is to provide	the provision of an improved apparatus for the	anism for terminaling lin delivery from the	ing sate a seposition of engiter contact the second section is a second section of the second section in the second section is a second section of the second section in the second section is a second section in the second section in the second section is a second section in the second section in the second section is a second section in the second section in the second section is a second section in the second section is a second section in the second section in the second section is a second section in the second section in the second section is a second section in the second section in the second section is a second section in the second section in the second section is a second section in the second section in the second section is a second section in the second section in the second section is a second section in the second section in the second section is a second section in the second section in the second section is a second section in the second section in the second section is a second section in the second section in the second section is a second section in the second section in the second section is a second section in the second section in the second section is a second section in the second section in the second section is a second section in the second section in the second section is a section in the section in the section in the section is a section in the section in the section in the section in the section is a section in the section in
s smooth and casy running device provided with a gale which may be opened and closed	sicam purposes in oil and gas burning bullers	les it optained.	Anthony Valle 1 - P Restricted that the control of
TRIAII MOTHER — P W Perman, Wood and, Wh in Disc case the aim is to provide a smooth and easy running device provided with a gair which may be opened and closed to permit the ingrews and carries of the direct initial and wherein like act of opening the late will lock the when I from mercesory.	Household Utilit e.	Railways and Their Acressories,	A fight I supposed to I a house the total
ale will lock the wheel from movement	FIYEXIT—L. W. Chank Carrieville, Mo Fin object here in to provide a divice, of tow cost which may be applied to the nordinary wholese seven with host little cost or trouble and which will permit dise free gives from the room or initiality, while at the same time effectually preceding that lugross.	MAIL BAU CAD HER AND INCIDENT	White final in Court for W. Without the Court for Court
MACHINE FOR HATHRHING (OTTO) — W W Plain and K F LAMPREL, July Trans. The sim in this improviuent is in provide fes	rost which may be applied to the ordinary	MAII BAUCARCHER AND DELIALBER Of a Distinct Arriver N Y This is a di- vice adopted to rective multi-or-other pick agest from and deliver multi-or-other pick	Visitation who ling 1 max 1-1 tel part dimping 1 malest the According to 1 library the
The aim in this improvement is in provide fest	and which will permit fles free egress from	ages from and deliver mail or other pack	Asparagus kulfs is i literaminas i tac ling fusioner i 8 lader is 17 is 4 Best mellicial i i ilinger is 1
machine, which enable the removal of rotton	the room or bullding, while at the same lime	ages to a tucking train from a stationary plan form. An object is to provide a derive which will suppose to the mail on, or other parkets to a looked position until a trigger is (ripped	Baking pan 1 Wing San Baking pan 1 Wing San Batte 16 man blue J A Schoof 1855 Barrel (handing neparation 8 Kallogg Sal Barrel bester 11 Frebit Sad
ures of construction for a collon gathering nachine, which enable the removal of cytion size instaining ripe collon from the plants liredly fain a recytiate as the nuchine is noved along rows of cytion plants in a field	PUBLISHED FIN CATCUES H PEAM &	to a locked position mittle trigger is (rigged	North bester [] Leabs Bol k risk for het lied in bester het lied in der het ker het lied in der het lied in de
norm along rows of cotton plants in a new	PUBLISHED REAL PROPERTY OF THE PERSON AND LAST TWO SERVICES ASSESSED IN IMPROVEMENTS	Dalland the Mark & Downson	Buring for pullys self-offing t M
	states the invinited relates to highers ments in portable means for eaching files. The in various has for its adject the provision of a device by the use of which the files in a house or dwelling may be removed quickly and of fectually, while at the same time old haling all of the disadvantages of foregoing in the day.	time halls tillnet trais brance. The favor tim tom consists in making use of the live force of the car to produce the application of the brake in soil manner that when the system of operating lewes has been brought by total	Buring ribrit Driver BM
Of General Interest,	device by the use of which the files in a house	of the car to produce the application of the	Binning, and wouthout other 1. 8. Leek by the state of th
MOLD—1) H Attacks Torringion Connists mold is for use in casting ingots such as reast lars, in be subsequently rolled into sheet rother form. It is capable of being okaned at closed without laying up much floor space of a reassed to never the formation of first	fectually, while at the same this ole taling all	of operating leves has been brought by hand	Cooks 5.4 Bed cut-fraction J t light 9.1 Hel frame J light 8.1
irana lairs, to be subsequently folk of his succeive other form. It is expanie of being opened	Machines and Mechanical Devices.	or through gearing into a determined position a case operated to a ar axis actionizes the system of terra and produces the application of the brake blocks to a determined extent and	Here and the the requirement for shifting and such marking H & Stand y RS-c Red I for A Herekon Red Red Litt good J & Pisher Red
is other form it is coppanie or being openies and closed without laying up much floor space and arranged to prevent the formation of fina and to allow convenient and quick removal of he canting freepective of any change in the numbers of the modd owing to capanish and	Machines and Mechanical Devices, MACHINE OIL APPARAITS FOR PRINT	system of brees and produces the application of the brake blocks to a determined extent and	Hell for A Benchmin Bed Bell good J F Plober Bell Hillion I tale expected sets J S Me
nd to allow convenient and quick removal of	MACHINA OII APPUARTS FOR PINNT 180, CHICKING AND AUTOMATEMIA SUMMING UP THE ALLES OF THE ATE OF INFERENCE KINDS AND HI BURG. I P BOLLING, 44 Hu Gining Parls France. The late allon provides a small contains making for in Association and	locking them in braking position	Inition that the second will a Vale Inition Research and the second sec
numbers of the sould swing to capanalon and santraction	ATH OF DIFFERENC KINDS AND SI	Pertaining to Recreation.	this blog agents apparatus for strong diluting and applying J V Wesseler Red
THE NE PROTECTOR -E. S. THACK Frank	Paris France The invention provides a small	DANGIAGI INFI A M I aperton Bruxton,	Michigan and applying J. Wesseler RA. Howpips F. L. McLathan RC. Histophy F. V. McLathan L. Leftlis RC. Hout Politing J. Vagili 1831
in Mass. The protector is such as used in onnection with trunks, boxes and other recep- acies for the protection thereof and each of	shocking tickets of till and steams and blad-	tig in this insignes provision is made for disness miding and packing the separated paris	Destin device for restricting subsecurities 1 A Species Belging 10 St. Letteres Bottl
actes for the protection thereof and each of	and for automatically adding up currespond ing receipts. It effects by a single operation first the impression upon each tickst of the	dismonmiding and packing the separated perision the shared for a construction wherein the doll is manipulated to simulate the constraints	Body a No. Dominion of and body a
hele's in general includes a number of curner wards siljusiably connected to nne saother by mans of the members, whoreby an upper and i lower frame are formed, and adjustable means joining the frames to hold them in	first the impression upon each ticket of the	of a data bug person and for a construction for a doll which is simple officient and the wearing period whereof are rapidly and easily replaced.	Boller bettom ti i infant i istalibiler setety applicar steam i light trei Boll S.W. Frantier i 154- 1650 and bilet Light i Dorj i 154-
lower frame are formed, and adjustable	date, destination price, route and number of days available Second, the simultaneous impression upon a checking sheet of all data placed on the ticket Third the sulomath adding up of the sums reflected.	wearing parts whereaf are rapidly and easily	Honord article med ninking same 1 N
osition on a receptacie	placed on the ticket. Third the automatic	replaced	Identified at this model making same 1 V Import 1 V Import 2 V Impo
UMBRELLA -R L SCREWINL and T SCRE	STREET-GAGE -P ROTOTER Fond do	Pertaining to Velricia.	Both and show Marterland & Butter 901 Both capping to the J A Mo Analty 931 Both coder II A Topper 1 Both coreing II Clear's 934
titit, New York N Y An object here is to roride a folding numbrella, which can be dis- olated and folded late a compact form, which akes up but very little space, which is easily		Orange N J An oldect of this invention is	Bottles or other receptain's ments for stop norther or a miles hit M. Johnson 855
akes up but very lille space, which is carlly	justs the height of the crown of the paved	to provide a tread having a form which facilitates its attachment to the wheel without	perfor resetting 14 V. Johnson Bellier stinger lock for J. L. Pel re 15ct Heiger lock for J. L. Pel re 15ct Horizon & Lhoute 15ct Horizon & Lhoute 15ct Horizon & Louis
annipulated both in opening and closing and olding the mains lia and which is sirvingly onstructed so that andden guels of wind or he like cannot easily injure or disarrange the	Lac, Wis This device detects inequalities in grading of street payments mechanically ad- justs the height of the crown of the payed- sired is movahly and guidably mounted on the street to be readily shifted over its sur- face and is emissible of heing adjusted to vary	THE TRIAD II TORILLIAN, West Orange N J An odded of this invention is to provide a tread having a force which facili- lates in attachment to the wheel without producing a predering of the scale is at the sides of the tread. Also to provide means for	Set for viels fische and similar oriets Par II & birnel
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rathe	TYPE WRITING MACHINE -N P Press	allipping of the tread on the lire	factors of halleling II b I hilling Solid Brirks exampositing I mailer for the many
INDEX OB DIRECTORY D T O'SULIVAN West Orange, N J is the present to	Charlesion 8 t' Among the principal solects in view in this case are. To provide a con- struction to occupy a minimum of space to	PORTABLE PRIMON —J B KINEFIT Cor- dele, the Phin invention is applicable to varie	Briefite of roulder street II b Thillips R54- Briefit J L Kriskins R54- Briefit or rubbing that me of A Baker R54-
INDEX OB DIRECTORY—15 T O'Bot- vitar West Orange, N J I at he present is usation the improvement has reference to decise or directories having aljustacitailly rranged words or asmes. The object is to reduce an index or directory having means we facilitating the finding of any name which a sought, and which will review the mind		for use in Imageriting as applicable in Ame for use in Imaporiting convict laborers. Here tofore they have been carried in confined quar- iers. Considerable inhumanity has resulted from the too close confinement during behave such as after working hours and on Ronduys.	Burner D 4 Blue
rranged words or names. The object is to	number of characters may be arranged to be employed and to provide a portable machine which is simple, economical and durable in	ters Considerable inhumanity has resulted	Button witing matchine 4. He man had: Labinat for speci fabrics storing and site
or facilitating the finding of any name which	which is simple, economical and durable in	such as after working hours and on Rondus	personny J k theri tass leading of annual for siliting or
a sought, and which will relieve the mind FILE-CABINET —W J. BALL, Alesred, fexts. The purpose of the laventor is to pro- ride an accounting device for use in retail		and holdays in which this class participate The chief purpose is to avercome the share disadvantages by forming a single detention	an centering and traing device Krammel & Talistern
ferns. The purpose of the laventor is to pro-	E KREENEY, New York N Y This mill is adapted to commitmus ore, crossed or the like	disadvantages by forming a single detention room or house	Car construction tt 11 Manus I ar deer operating mechanism t J Reblin 074
	from a comparatively large six to a fine now	VIHICLE-TIRE -H B Tonias Hoboken	lar feuder J D Marvil Rd
tore and like business places which transact	der It is adapted the sent to sent den		
ride an accounting device for use in retail tores and like business places which transact suniness with a large number of customers each lay which may be easily understood and oper	der It is adapted for use in wet or dry crushing and consists primarily in a tube	A J The invention comprises the combination of a rim cushions mounted thereupon a com-	lar funder P Petaky Lar funder P Petaky Lar funder P Pallway R Murphy Lar funde C P Auliona Lar method to done done
rema. The purpose of the lavestor is to pirche an accounting device for use in retail course and like bugshess places which transact coulness with a large number of customers such any which may be easily understood and operated, and which will eliminate a large amount of unsecreatry book work, while at the mane than the country of the country of the country of the country book work, while at the mane may be compared as a correct account of such and	COMMINED BALL, AND TI RR MIT.—J R KERMEN, New York N Y The mill is adapted to comminute own, creamt or the like from a comparatively large six to a fine pow for it is adapted for use in well or dry creathing and consists prinarily in a tobe creathing and consists prinarily in a tobe stages. It performs in one mechine that which formerly took lue to accomplish DRILLING-MACTITIE. — G McKstours,	h J The invertion comprises the combination of a rim cushions mounted thereupon a com- posite member having zero-raily an annular form encircling the rim and with pertinos sagning the cushions, a pluratity of members arranged to a general annular form and con- arranged to a general annular form and con-	the control of the co



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refrongered afternating currant is, Lar gine two these varieties gine by Manu. The second of the sec

EXECUT PRINTS 19, PROPER AND PRINTS. called "
continuous from some \$440,"
and the prints of the prin extremely sman area, and the sortness of its body, make it difficult to understand how this noise can be produced, but I give the fact on the authority of an emi-nent observer. Before leaving the borgive the fact on the authority of an emb-net observer. Before leaving the box, ing bestles of the genns Assolven men-tion should be made of the species known popularly as the hread or past bestle (A penticevan). It is very con-bestle (A penticevan). It is very con-nected by the control of the con-tantity," for it appears to set almost, another the control of the con-tantity," for it appears to set almost, anything which it ancounters, from dry wood to Carvenne pepper, although it seems especially to appreciate bread, his-cuits or other concections in which flours and water are the chief ingredients. It is often most destructive to the stored goods of merchants, as well as to the account of the control of the photographs here reproduced show samples (1) of mearcants and (3) gin-samples (1) of mearcants and (3) gin-

been rendered aimost worthloss in this manner while there is a case on record in which twenty-seven follo volumes, standing side by side, were perforated in a straight line by one Anobius grub or "book worm" Its tubne was so perfectly drilled that it was possible to pass a string from one end of it to the other, and thus lift up the entire set of twentyand that int a pice of the entry behavior of the entry of

ness of their heads and the strength of their however, their jaw muscle.

Probably faw poople, save those who dashed in natural history, are sware that the abbie in natural history, are sware that the abbie in natural history, are sware that the area to be the formed by wine meritance in the formed by the peritance in the control of a bestle known to science as fast-lars are affected by this peat, and its demonstrated for the formed by the peat and its demonstrated for the formed by the peat of their formed peats of the formed by the peat of their formed peats of the formed by the peat of their formed peats of the formed p resourced the traditional air-and-emi-light habits of moths in general, and to frequent by choice the glotom of subter-rison values, the property of the resource of the control of the location, and when the tiny calespillars backs they burrow into the substance of the cork, just as the exterpillar of the log goot moth berrow into the beart of an oak or an applic tree.

The presence of the wine-cork peet is fact may be displeasing to many. We if manifested its an accumulation of cork-ine were to avoid food or bewragas without and return ("frain") round the ex-ply because one doubted their present out and return ("frain") round the ex-ply because one doubted their present out of the cork. This as from contamination, by finesch, one cumulation may be seen in one of its world eat and strink very little induced ("policies heaveful Later, if the first by the contamination of the period is doubt if there is paid or present the contamination of the contamination

it may almost be described as a common object of the dessert table, for few figz, save the most recently imported, are quite free from the small white grubs of this moth. In passing, it may be remarked that this attack cocoa bear

attack cocoa beans,
But while the fig moth acc no small amount of damage, its depr tions are far less serious and w ind water are the chief ingredents. It is osman among damage, its depredations of merchants, as well as to the stood of merchants, as well as to the photographs here repredened above seek which come unbidden with the amples (1) of marceroni sod (1) gin-desert. I am able to reproduce a photograph in the first and the photograph here produced almost the restrictions as stock of boots and almost produced and the stood of the

When the gruh is full fed it bores its war out of the apple, and eventually spins a coroon of rough silk in a crevire in the tree trunk, or on a neighboring fence in which it changes to a nongaport of the spin silk in the
nutness, coffee berries, and certa of spices. The annexed photograp us a sample of Java coffee, som years old, almost every herry of wh has been bored by this pest, .Fortunai the stacks of this beetle do not all the stateth of the coffee when the quality of the coffee when Nevertheless, it is quite certain th buying old coffee one buys also a amount of ground-up beeties

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vile must, therefore, form an actual part of the bread which we can small moth abother corn part and the mail moth abother corn part and the state of the state o

Enggy-top Campies for Launches. Experiments have just been completed by the naval constructors with a view to the adoption of a new type of campy for use on the naval launches When the launch of the U S S. "Minne-

When the faunch of the U S S. "Minne-onia" was lost in Hampton Roads with several middhipmen on board about a year sag, the fatality was attributed to the fact that the canvas covering used as a pytocetion against the weather was fastaned in such a manner that it could not be quickly released, and the men were hop-leastly imprisoned in the sinking boat This fact led to make criticism of the type of canopy used and the secretary trans."

trape."

The constructors have been working on a design intended to overcome that directly, and several types of chaopies were steeted on launches of the Atlantic fleet within the last two or three months The result of these tests is the adoption of what is commonly known as the buggr-lop canopy This is made of can work that the second property of the second proper

justed and folded out of the way, similar to those used on automobiles White the new style of canopy will not be as durable as the old fashioned one, and will not afford the same protection against wind and rain, in case of a collision, and the isunch is in danger of being sunk, it can be quickly put out the way and not smdanger the lives of upants of the boat

By microphotographic methods, the vi-brations in an incandescent filament, due to the expansion and contraction caused by the paleage of an alternate current. have been recorded An are lamp was used as the source of light for photo-graphic purposes, and if the are in hel-freen the same also without one or seen from the same also without one or seen from the plate to grachronian with the rise and fall of the alternatus pressure. With a 100-andie-power carant lamp, sup-pides with alternate current at 50 alterna-tions, a slight humanian noise was precupy? times, as alternate considered that this may it be a cause contributing to the shorter of the proper contributing to the shorter of the caracteristics.







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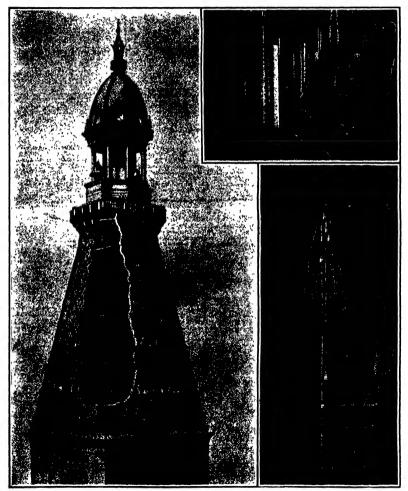
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CHARLES ALLES MINK Problem
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NEW YORK, SATURDAY, APRIL 3015, 1910

The Killion is always glad to receive for examination illustrates on arbitets of timely interest. If the photographs are story, the statement of the story interests of the part of the story, the attention. Accepted articles will be paid for at regular space rate

WHY MOT A GOOD BOADS LABORATORY!

WHY NOT A GOOD BALDS LABORATORY!

WHY NOT A GOOD BALDS LABORATORY!

A used important one in the United States,
has recently been rendered of critical urgmobile—the must destructive vehicle to read surface
that ever run on our modern highways. The public
restructive offerts of automobile tradic should be
destructive offerts of automobile tradic should be
tempored by the recognition of the fact that it has been the most active instrument in awakening the public to the necessity for abandoning the old slip-abod methods of road building, and constructing them secording to the best engineering practice if it were possible to robuild all our roads of the

most approved and highest class of construction, and if the most suitable material were everywhere avail able, the problem would be greatly simplified, but such uniform excellence is impossible, both because of maintained and the unity of include recognition and analysis within excensive in builting distance of the work in a country of such wide extent and such varied geological formation as the United Battes, the question of the best kind of reads to build in any locality must be determined largely by the local conditions—the climate, particularly as regards the amount and distribution of the raiseful, the ustare of the underlying soil to bearing quantity, especify or quick drainage, etc. and show all, the character of the materials available for read building, must all The Prench engineers, with their characteristic thoroughness, have long recognized the importance and complexity of the good reads problem, and nearly haif a century ago they commenced that careful investil a restury ago they commenced that careful investil settlem which is still being carried on by a force of the cost and of the difficulty of finding the ideal

a century ago they commenced that carrell livestly action which is still being curried on by a force of trained experts. The anatytical study of the subbect, which was set on foot by M Burlel, Reginers of Reads and Birldges, as far back as 1858 has developed into the present musicinal laboratory, which has so considered by many to be the fluwel in existence At the date mentioned, apparatus was installed for testing the resistance of paring materials to wear by ricting, which was followed by a machine for testing the resistance to abrasion of the stone used in Machine and the statement of the stone used in Machine and the statement of the stone used in Machine and the statement of the stone used in Machine and the statement of the stone used in Machine and the statement of the stone used in Machine and the statement of the stone used in Machine and the statement of the statement

Now here, it seems to us, is a plan which might very well be followed in this country by the found-ting of a national good reads laboratory, say at Wash buston, which might co-operate with similar but smaller institutions provided for and controlled by the various State institutores. The cost of carrying on such institutions would represent but a moderate percentage of the money that is anuually thrown away on the construction and so-called repair of highways by the present defective methods

BATIOVAL STREET LIGHTING

TATIONAL STREET LIGATING

THE proper lighting of a city is not so much a question of the total quantity of light provided as it is of its proper distribution. Because of the fact that America is the birthipine or modern selection illimination, and the country is which it was first developed on in tetra weeks, there is a popular impression that our rive scale, there is a popular impression that our rive scale, there is a popular impression that our rive scale, there is a propier impression that our which we have distributed our lighting, the resultant illumination, judged by its adaptability to the

eds of the user; is far less salisfactory than it

monds of the user, is far less minimized by their translation of the user, is far less minimized by their translation of the less and the federal as the lighting of European cities. This question was recently dealt with by Dr. Loais Bell in a paper read before the American Boolety of Musichal Improvements at its assual conventions and the principles which he lad does are at each so obviously sound and so frequently disregarded, that they are will routhy of cartain study by the municipal authorities throughout the construction of the control particular character of the streats in which it is plared The must thorough have, in which there is considerable night termin, should receive as amount in circular where trade is light, and where passers-by are few. It is sufficient to provide mough light to enable the people to get about comfortably is also, a third class of streats, lying more remote and centing under the head of subtrans reads, require coming under the head of authorizan roads, require yet another method of illumination Since the funda-mental purpose of lamps in the outlying, little-used streets, is to serve as markars of the way, the naing of very large units, widely spaced, is obviously im proper, a better way would be to employ small units located at shorter intervals.

located at shorter intervals.

The principal streets of American cities, according to Dr Boil, as a rule are poorly lighted, the secondary streets are lighted sometimes better and sometimes worse than they about be, and the third sometimes worse than they should be, and the thrift clean usually have one kamp in every long block, which is useless, except within a comparatively short radius, for such purposes as facility than un-ber of a house or reading the address in a nots book. As to the absorbet amount or light required, the principle should be followed that in the principle streets one should sever where have enough light to read a paper by, which is the standard of illumina-tion adopted in the principles streets of the large cities of England and continental Europe Rathes is chargealle to the method commonly am ployed for measuring street illumination. The usual plan is to measure the light half way between the

lan is to measure the light half way between the iamps with the photometer disk held normal to the lamps with the photometer disk held normal to the ray, and, naturally, the tendeurcy of competitors for this lighting contracts is to secure the specified mini-num at as low a maximum as possible Indeed, owritin types of illuminatus have been deliberately specialized for the purpose of giving two-bundredths or three-hundredths of a foot-caselle at a distant point. New, if these liminatus had been designed as they should have been, not to give a special form of iliminiation, but to give the best efficiency of which they were capable, it would be possible to make then light not ouly widely distant parts of the street, but the whole street. While it is not desired to attain to uniformity with a low average of able to attain to utiformity with a low average of light, it is equally underlinible to concentrate the light at certain points separated by long stretches of comparative darkness Summing up, the important points to bear in mind are, first, that streets are lighted for the people to use, second, that that streets about the lighted with reference to the particular about the lighted with reference to the particular light, apeaking generally, all the streets should be more brilliantly lighted than is customary in the United States to-day

A BATTLESKIP PLEET IN BAUM OCHAW.

A BATTLEMET FIRST IN BAIR OCEAN,

A BATTLEMET FIRST IN BAIR OCEAN,

O'R many years one Navy Department has followed the policy of concentrating at unamazing the property of the control of the property of the total displacement.

Every nation is following the same policy today, and has done so since the introduction of the first freadnought to 100e Many years before that data, however, the United States had practically cossed to half protected cruisers, and was concentrating to
strength in reseals of the arthered chast, dis majority of which were heavily-guarant latifications. The offeractage of this policy is solid in both late.

The offeractage of this policy is solid in both late.

The offeractage of this policy is solid in the late of
control of the protection of the control of the control of
control of four ships, uses in the Alkantin and four
city to be complete bittlement places, and would
have been a certain number of dreadnospital, and would,
herefore, be individually united here jovened than
the one which made fine frequent eviden arrend the
world Although the objections, fees not assent
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Security is the time of the state of the sta

in Morrotte, the thirt at Storon, the fearth and the collegible, and the armored cruiser division at the Portamouth yard.

If the present plana are followed the battleship feet in the year 1911 will be made up as follows: Piret Division, fassible "Consections", and the free dreadmonghis "Florida", "Utah," "Dalawan," "North Andrott," and "Michigans" "Second Division, the dreadmonghis "Horder," "Utah," "Dalawan," "North Louislana," "Kanana," "Warman," and "Naw "Hamp Louislana," "Kanana," "Warman," and "Naw "Hamp Louislana," "Kanana," "Warman," and the sister ships "descript," "Whitnatha," "New 2nd," and "Groundertest" class, the sister ships "Mckensteps" and "Tokho" (smaller "Connectents") and the sister ships "Mckensteps" and "Tokho" (smaller "Connectents"). There will be a fifth division consisting of the four armored crusters ships "Mckensteps" and "Rottman in the year 1911 we shall have "Tennesses", "Washington," "North Carolina," and "Rottman in the year 1911 we shall have service, consisting of two free shall consistent of its dreadcoughts, the second division, of the fourth division, of the fee "Connectents" and the steve smaller "Connectents," the shall have coughts and these "Connectents" and the steve smaller "Connectents," and Missellings," and the fourth division, of the fee vessels of the "Georgie' class. The

still direction (armoned cruisers) would contact of the four ships of the "Tennessee" and "North Carolina" class.

Our readers will recognize at once that in the above organization, ships of the same general type have been assembled in the amme division. The largest vessels will dock at the New York and North party of the property of the property of the property of the property of the control interface and the sent and the auxiliary vessels of the control interface and the sent and the auxiliary vessels of the control interface and
Special place of the special part of the speci appropriate the master of the Watson cutter stie" in 1887. "Thistie," by the way, under her present same of "Comet," is still in good shape, and is still being used, we believe, as a training ship in

the German navy
The litros engineers appointed by the Canadian government to consider the application of the St. Lawrence Fewer Company for permission to dam the Long Smill Bayets as Correvall, Outstite, report that the Smill Bayets as Correvall, Outstite, report that the Smill Bayets as Correvall, Outstite, report that the Smill Bayets as Correct that the Smill Bayets as Correct that the Smill Bayets as the Correct that the Smill Bayets as the Correct that the Smill Bayets as the Correct that
York State hanks of the river.

3) as efficially ratised that all the encavation that was containly stated that all the convention that was containly stated that all the convention of the Panasa Canal has now been completed. The original period of the canal called for the removal of 103,755,000 orbit parents of materials, and a few weeks ago the tools re-cavation done to date under American company has remarked that amount. The 11,000,000 cubic parents remaining to be encavated represent the additional work making to be encavated represent the additional work making to be encavated represent the additional work as a second that by the collaryments of the canal, which was decided upon during the Romewell administration.

was decided agon during the Roosevell administration. The Chandles government is giving consideration to a project for a reight traffic railway to Heber and the project for a reight traffic railway to Heber and the project for the railway to Heber and the railway to the operated to its full appeality for about two months of the year, during the moving of the grait crop, and that for the other tam months throw would be searonly sufficient traffic to warrant operation. It is estimated that sitteen trains per day cound be handled over the state of the trains per day cound be handled over the state of the trains per day cound be handled over the state of the trains per day cound be handled over the state of the trains per day cound be handled over the state of the trains per day cound be handled over the state of the trains and the state of
wheat could be delivered in thirty days' time.
The battlessly "Indicates" has undergone some tests
of the "ship brake" with which she has been equipped
finis device consists of a pair of steel wing, hinged
to the resent's side and normally hold against the
case of impending collision, are released through
mechanism controlled from the bridge. They swing
open automatics lity through the forward motion of the
ship, and it was found that the vessel could be breight
without talgerious theck or strain.

Whose the strain of the British careful.

without injurious shock or strain
The "Meptum," the latest of the British dreadmoughts, will have, it is stated, the same length over all,
860 feet, as our own "Wymning," but her beam will
be several feet less than thet of the American vessel.
Ble will carry in 66-caliber 13-lached gues in fivturrests, the two twrests amidathy brings placed diagonstall, so as to cambia full not guas to be fired on either
broadside Rer concentration of fire from her 13-inch
guas will be als abod, eight abora, and ten on the
broadside, as compared with the "Wymnings" flee of
our about, four astern, and tweet on the Incodelle

four absol, four astern, and twelve on the brusdation of The United States Ricel Corporation, which received made a general increase in wages, has decided to put in force a system of pensions and disability payments for the wives and children of those killed in its omploy, and of disability payments for the injured. The corporation will also abortly spilin force a pension system of the properties of the properties of the properties of the disability of the properties. This increase is the properties of the properties of the properties of the properties of the properties. or superannated and disabled employee. This movement is to be most highly commended. In its humanitarian aspect, it will be a great boon to the employee, and its wisdom as a means of promoting loyalty and checking the growth of anarchistic schitment is un-

m work will shortly commence on an e stependous buildings which are rapidly other of those stupen

Construction work will shortly commonce an attended to these expensions buildings which are registry carriang for New York the right to be called a city of tower. The new structure, which is to be beint at the northwest corner of Wall and Namen Erresto. As the new the state of the tended of the state
ELECTRICITY.

As a second missing of the Electrical Club of Chi-cage, it was brought out that there are three thou-sand storage shatery missionlies in Chicago. There are thirty-three storage battery installations in the city with an output of 47,000 kilowatis, while in New York city the total output is 87,000 kilowatis, while in

York city the total output is \$7,000 historia.
As old bargs has been equipped with electric welding apparatus at Gothestern, Swedon, to be used in regaring the bollen of steinners. The equipment consists of a De Lavat turbine and two direct-current generators. The current is condected to the steamer requiring repairs by means of a pair of cables, and work can thus be done within the bollen with power generated on the bargs. The bargs is also fitted with a workshop where small repairs may be made.

An enterprising newspaper in South America about to install a wireless telegraph system at main office. This will be the first wireless newspaper mann omose. This will be the first wireless newspaper office on the continent. The paper we refer to is La Prenza, of Buenos Ayres. The Argentine Republic is going to celebrate its hundredth anniversary with an exposition this year, which opens on May and La Prensa expects to keep in "wireless" with the exposition ground

A French inventor, M Faul Jegou, has devised an electrolytic detector which operates without the use of a battery to affect telephone receivers. The detector consists of a glass cup containing at the bottom a tor consists of a glass cup containing at the bottom a small amount of mercury with some pure tin in solu-tion. This serves as one electrode, while the other electrode is of the usual type, namely, a fine Wollaston wire. Dilute subpluric acid is used for the electrolyte wire. Direct surpaire acts is used for the electrolyte The detector is found to act like a gmail battery, and yet pomesses all of the sensitiveness of the electrolytic detector. One of these detectors used at Paris was found to receive signals sont from the Ouessant post on the coast.

Considerable attention has been directed of late to the effect of sunlight on the transmission of liert-slan waves. A writer in Electrorechaised Schickrift, in commenting on this subject, points out that the stronger the austhing the less the conductivity of either to the Hertains waves, so that it is incorrect to ether to the Hertzian waves, so that it is incorrect to speak of a wireless telegraph station as having any definite range, for one which has a large radius of communication in northern istitudes would have a much smaller radius in the tropics This would be particularly noticeable on vessels sailing north and south, and he suggests that it would be desi prepare a "radio-topographical" map, giving the rela-tive conductivity of the ether at different latitudes

A comparison of the inclosed are and the intensified are for indeer lighting was recently presented before the Minnesota Electrical Association convention. It the Minneson Riccircal Association convention it was shown that because of the large carbons used in the Incised are, the carbons being half an inch in the Incised are, the carbons being half an inch in diameter, the are is any to wanger along the edge of the electrode, so that instead of giving a uniform distribution of light, the light is greater on one are tribution of light, the light is greater on one are tamp, there is no wandering of the art. The sector of the control of the trodes a quarter of an inch in diameter, and a lower one three-sighths of an inch in diameter. If the same amount of current is passed through this lamp as through the inciosed arc lamp, the electrodes will be hested to a higher incandesounce, thus giving a greater and steadler light.

bested to a higher incandescence, thus giving a greater and steadier light.

The Board of Underwitters of Chicago has insued the following requirements for wireless telegraph in stallations Aerial confinctor must be at least No. 8 B and 8, gape rubbercovered wire run on potitional insulations on exterior of building and on hone, cleats run nothing in interior of building, Proviolate bushings to be used through walk, partitions and foortheen the contract of the state of the contract of the

SCIENCE.

Bu a recent number of the Astronous Nachr. C. Creaki calls attention to a new variable star or nova, froud an a plate taken March Nach 1908, at 105 dm. to 15th. Sm. (Moscow mean time) The image was found in a position that was reason or 34 previous plates, bhowing stars down to 135 magnitude. The start approximate position is c = 38 Dm. 180. Sm. 28. = +38 approximate position is c = 38 Dm. 180. Sm. 28. approximate positio

G. A. Campbell recently conducted some experiinvestigate the subject of teleph to Investigate the subject of telephone intelligibility in his experiments, usually only detached withhis were supplyed, so as to give the listener no cine from the context. The syllables easy to interchange are right in about half the cases. Thus while it is obvious that the belophone controlly distorts spoech wares, not the context to the context which nearly resemble such other are not sufficiently distorted to be indistinguishable.

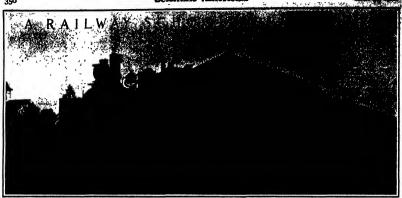
A good photometrio measurement of the brightness of the nucleus of Hattey's comet was obtained on April 21st by Prof Wendeli at the Harvard Coliege Observa-tory The measured magnitude of the nucleus was 64 tory The measured magnitude of the nucleus was 45 the total brightness of both the outleas and the sur rounding coma was a little above the fifth magnitude. With the approach of the most loward the region in the sky in which the connet is found there will be very little to rough the early riser in fact, astronomers do not look for any spectacular display while the connet is in the eastern sky.

From a study of the radio-artivity at the earth s surface, made by G A Cline, it would seem that the soil contributes by far the greater proportion of the peocirating radiation present at the earth's surface at Toronto, and by comparison any that may heve its source in the atmosphere or io the sun may be considered to be negligible in amount. There are no diurnal maxima or minima, but the changes from day to day which seem connected with changes from day to day which seem connected with concurrent barometric cheoges. The conductivity is greater when the ground is baro and warm than when it is frosen and covored with snow Fittering air through cotton-wool still leaves many snepension particion

A letter has been received from Prof E B Frost, irector of the Yorkes Observatory, at Harvard Coliege Observatory, in which Prof Frost records recent observations of Halley's comet. He found the comet more conspicuous than the adjacent star Pascium, and Prof Barnard estimated the nucleus which not stellar, to be two megnitudes feinter than star On April 14th the comet was photographed with six minutes exposure No tail was visible with any of the instruments Visual observations of the spectrum were made by Prof Frost and Dr Si trum were made by Prof Frost and Dr Slovum, and showed a distinct continuous spectrum from the nucleus No bright bands or times were seen. The intensity of the continuous spectrum relative to the emission bands, itse greatly changed since the comot was visible in the evening

Some idea of the enormous amount of labor required to extract radioactive substances from their ores may be gained when it is considered that to obtain two miligrammes of substance containing 0 in miligramme of polonium. It was necessary for Médame Curle and A Debirme to treat several tons of uranium Pairly pure helion was isolated from the gasees given of by a solation of polonium under a high vacuum to a quarta tube, due to the artion of the siphs rays emitted by this element. The life of radium is about more contained to the containing the con to extract radio-active substances from their ores may from radium. The atomic weight was estimated to be about 200

A new preparation has appeared which cleans and polishes sliver, silver plate, nickel and other white metals, and which is said to produce a plating on pursliver and any metal except gold by mere contact of the preparation with the metal in view of the pubthe preparation with the motal in view of the pub-licity given lately in British scientific journals to a similar preparation invented by Rosenberger it is in teresting to note that the American article has been known in the United States for several years although offered more prominently only since 1908 offered more prominently only since 1908. Rosenberg-er's preparation requires a different modification fo-ceach metal. The American preparation is a white, oreany liquid, perfectly stable and numflected by light, and is claimed to be perfectly free from morrory, solds and other injurious ingredients. So far as we are asite to determine, its platting action secons to be due to the stabling which the motist to be platted certain. due to the silinity which the motal to be plated exerts upon the molecules of all laws in the solution, so that the resultant plating is identical with that produced hy ordinary dynamic electroplating. No electric cur-rent is necessary to produce the plating nor is an ad-dition or admixture of any other gubstance required.



Demonstration train at a way station in California.

in response to an urgent request from leading dairy interests in Southern California, Prof Lercy Anderson, head of the dairy department of the Callfornia College of Agriculture, has just made an examination of the milk conditions in that part of the

Prof Anderson says that in consultation with the Prof Abderson says that in consultation with the dairymen, it was decided to inaugurate a general policy of education upon the subject in his opinion, the reform of many conditions now undesirable in the methods of producing milk, can better be reached through the commercial aspect of the business and through the education of the producer and the con-sumer than through drastic and radical legislation

sumer than through drastic and radical spissation.

He says that he finds the conditions under which
fillk is produced about Los Angeles are not materially
different from conditions in other populous centers,
crospit that nature is possibly kinder in granting more

except that nature is possinly singler in graduling more sunshine and less ratis and a more porous soil, all of which tend toward an easier cleanliness. What advice he has to offer, therefore, is applicable to all parts of California. He hopes especially that the man who is producing and selling directly to conthe man who is producing and sening directly to con-sumers in the smaller towns and cities, whether he has one cow or more, may receive an Incentive to have better cowe and keep them in a clean and a healthy condition

healthy condition In cities like Los Angeles and San Francisco, he says, where large wholesalers act as distributing agen cless between the producer and the consumer and pastetrize all the milk, some of the dangers that might result from disease of the cow and uncleaniobviated

ness are obviated "it does not have a pretty sound," continues the professor, "to say that lack of care on the part of the producers is partly the reason for the expensive pasturisation which the wholessiers

now give to milk."
"Pasteurisation, however, ie one
of the advance ateps toward a
healthler race, and some day this
process will give way to such clean
methods of producing milk that it
will not be necessary That is the
goal toward which we are all striv-

ing "It costs money to produce clean milk, which cost must be met by a higher selling price or hy more profitable cowe, or both The cow is especially in our mind just now, and we call the reader's attention to records taken from different sources to show by actual figures how cows vary in returns to their owners from elmilar outlay for food

and care"

Prof Anderson then refers to the
subject of proper stables and corrais for dairy cowe and says

"The great thing to be desired in
either, is that there should be easy
means of keeping clean and then coop them clean. This is the chief It done not decay and then foul bdors, and it can be down with water and sweet in a few moments, so that no dirt remains. So datrymen object to cows standing on concrete, but in California, where the cows are in only for feeding

in California, where the cows are in only for feeding and milking, they enfer no injury
"Occasionally a very good stable is constructed where the cattle stand, which portion is made of plank. This works well from a sanitary point, if the planks are water-tight or are understad with a strength substance so that the soil under the planks cantilght substance so that the soil under the planks cannot become seturated

not become saturated

"A milking stable is absolutely essential to the production of clean milk Milking in the corral is an abomination, either in winter or in eummer. In win ler, during the rainy season, it is not uncommon to

ier, during the rainy season, it is not uncommon to see both cow and milker wasting nearly to the knees in mud, when of necessity the milk must become the depository for some of the mud.

"In summer, when the corral dust may be from one to four inches deep, the condition is even worse. The dust is raised with any slight breess or with every dust is raised with any siight breeze of with every movement of man or best, and even more dirt finds its way into the milk than during the time of rain and mnd. Thus the cows must be provided with some stable which is dry and clean, and where they can be held for milking

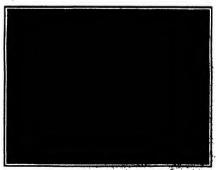
"The stable needs not be expensive On the con-trary, it may be very simple, and the less lumber in it the botter so long as the frame is sufficiently strong it should permit the cutrance of an abundance of direct sunlight and have enough openings to give con stant ventilation. Large lonvers in the roof are excellent for ventilation and also admit light, but not

Saloi Liniment for Burns.—Saloi, 10 parts; olive oil, 60 parts; lime water, 50 parts

Bread Under the Hieroscope,
Bread, lite mith, is one of the most general articles of food, and as such is subjected to the most frequent adultation, and unfortunately it happens that desired in the such is subjected to the most frequent adultation, and unfortunately it happens that the subject of the subj No lies set aside for further examination Besides, to the water in the vessel is given an opportunity to clear itself, and it is then decanted so carefully that the sediment is not disturbed. The result of anch treatment is that from the deposit on the sieve and that in the vessel the true composition of the bread on he assertained.

Bread made from pure flour leaves only an imper ceptible quantity of starch on the sieve On the other hand the greater part of the ginten is found on it and

art or the ginten is round on it and forms a not of irregular meshes and shows some resemblance to vegeta-hie tissue In consequence of the case with which its presence in the bread is ascertained, the giuten is especially important for microscopioal examination. In the same decal examination. In the same de-posit the microscope showed nu-merous particles of starch which during the preparation of the bread changed their ordinary form or leave ferend to explosion. Buill there is a resther considerable num-her of them that have escaped this ner or them that have escaped this indicence and are easily recognized from their size, color, form, and the presence of the navel. These state-pents regard wheat bread only. The result when ree bread passes under the same procedure is that the deposit on the sizes consists of glutons only, and therefore propor-tions in a mixture of both kinds of large only an association with a large discress of anatomos under the antencorote. Tradeslary, however, in this dense through a last of the promption of flow, done of graning promption of flow, done of graning promption of flow, done of graning promption of the property of the delinest control of the pro-dict of the state of the state of the state of the state of the delinest of the state of the sta out on the sleve on



Lecture in agricultural and institutions, designation with

Daby exhibit, agricultural demonstration train

Coreal exhibit, agricultural demonstration train.

A RAILWAY SCHOOL FOR PARKERS.

placents. The most resemblance to these is shown by the grains of barley, the addition of which is ascer-tained with a satisfactory degree of certainty from the precipitate on the sieve A quite customary adulter-tion of hread is effected with rice flour, which always

falls to escape the scrutiny of the microscope when this is invoked, for the grains of starch of rice are always left in great number on the sleve and are more easily recognized because during the preparation of bread they suffer less change. This result of M. Col

ita's investigation is extraordinarily important, for the addition of rice flour to wheat flour or to rye flour has begun to be a veritable torment Besidos, certain kinds of corn meal have been misused in the same

REAPER BOAT Α

BY THE PARIS CORRESPONDENT OF THE SCIENTIFIC AMERICAN

A French constructor, A Amiot, has brought out a type of beat combined with a set of cutting blades, which is designed for me in cutting off squared provides a set of cutting blades, which is designed for which contains the contained of the con A French constructor. A Amiot, has brought out an internal combustion motor mounted on a boat, an the motor serves to drive a set of cutting blades, which are designed somewhat after the fashion of reaper blades and adapted in their form so as to carry out blades and adapted in their form so as to carry out the cutting of the plants under water in the best man ner The boat is rather narrow, and fist bottomed, being much narrowed at the front and the rear In the front is carried a paddle wheel, which is run by a gusoline motor, which

Its total length is

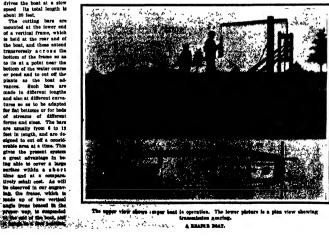
the cutting bars are mounted at the lower end of a vertical frame, which is held at the rear and of the boat, and these extend transversely across the bottom of the frame so as to lie at a point near tha bottom of the water course or pend and to cut off the plants as the boat ad-vances. Such bars are made in different longths and also at different curva-tures so as to be adapted fat bettoms or for beds streams of different ms and sizes. The bars forms and sizes. The bars are usually from 6 to 12 feet in length, and are de-signed to cut off a consid-wrable area at a time. This gives the present system gives the present system a great advantage in be-ing able to cover a large surface within a short

beins aware then the end of the ferre, which is ob-served at the imper part, and this lever is pitted in an appriabl. By means of the countercepth at the old of the lever, the entire frame can be raised and levered, and this gives the adjustment of the cutting bear at any desired height in a convenient way. The passedine motor is placed at the other end of the beat, and there is a belt transmission running to the rear and there is a belt transmission running to the rear-part of the cutting bar frame. This does not later free with the raising or lowering of the frame, and work at different angies. On the baths of the pulley is a creak which drives a red, and this inst passes down about the frame to the lever part, where it con-deven about the frame to the lever part, where it con-tent is the second of the pulley of the con-tent of the cutting bar frame to the lever part, the cutting bades are given the to and fro movement in the same

way as is seen in the usual bindes, and in this way a wide swath is cut under water and at any desired height above the bottom The paddie wheel is carried height above the bottom. The paddie wheel is carried on a frame which is adjustable by means of botte, so as to give the paddies any feetred immersion, and the specifies most of river the wheel by pareling and chain device, using two separate counternhafts for this purpose so as to give the nuevide speed reduction. The guardies motor is operated at the standard speed of 50 revolutions per minute When it is required to 50 revolutions. take the boat into shallow water or otherwise to pass over rocks or other obstacles, the cutting frame can be iffed entirely ont of the water. In this case the cutting bars are folded up along each side of the frame cutting pars are toiced up along each side of the frame so as to eccupy but little space. In usual practice the cuiting is carried out at the rate of 1½ miles an hoar, and the cost of operating is estimated at \$0.55 per mile, compositing gasoline, oil, ishor, together with depreciation and maintenance. For cutting one acre area, the cost is figured at \$2.70

The Amiot system is meeting with great sucneesing with great suc-cess in Europe, and it is now in use on the artifi-cial inkes of the domain of the institute of France, at Chantilly, and also on the donain of Lacken, be-longing to the King of Bel gium It is also used on a number of canals and rivers in France

According to the Elec-trical Review and Western Electrician, the Park Building at Pittsburg, Pa., which is 15 stories high witten is 15 stories high and contains 400 offices, was recently lighted by carbon filament lamps and had its interior decora-tions painted a deep sea green color. It is now green color It is now lighted by tungston lamps, and has its interior paint and has its interior paint od a light buff color On replacing 3,810 carbon lamps (66-watt) by 780 100-watt and 300 25-watt tungsten lamps, and 21, 840 watts in 16 and 32 candle-power (arbon lamps in the corridors and lifts by 8,400 watts in 40-watt and other tungsten lamps, 149 4 kilowatta is saved.



The upper view above conper beat in operation. The lower picture is a plan view showing

THE RESTATOR INSTALLATION OF THE METROPOLITAN LIFE TOWER.

in the newly-completed Metropolitan Life insurance tower is to be found an example of an installation which serves the purpose of lifting cars to an alti-tude greater than that attained in any building yet constructed Judged independently of its height. the installation is a model of modern elevator engineering. Furthermore, it is significant of the succession neering. Furthermore, it is significant of the success-ful development of a comparatively recent type of di-votor machine which has been tested in actual use and found to answer the requirements of service as well as the requirements of mere height. Great as the lift in the designers claim that it is possible to go even higher and that it levels to no even higher and that elevators can be installed to may skyrerograw which the amplitious architect may yet essay As a result of this engineering achieve-ment there is no difficulty in renting offices far above the city's noise and dust. No more time is consur in reaching the 44th story of the Metropolitan to than the 12th floor of older buildings.

For the Metropolitan Life tower, the type of ele For the Metropoilian Life tower, the type of ele-vators selected was the Oils true into overhead machine, in which the motor and driving abserve are situated directly above the hatchway. High up in the apea of this white wardle campazile are to be found power-tiv electric motors, whose installation at this slora-tion trand the ingenuity of the architect and engli mer "Thoy are without doubt the highest motors

working in any building

The problem of high rise in a tower building is The problem of high rise in a tower building is non that can be solved by but few types of elevators. A height of 400 feet marks the limits of the planes and other brigantic inschines in many forms of sisterical elevators the weight of heavy moving cables or other parts, and the exact regulation of the car or lead, are difficult if not impossible of attainment when certain beights are exceeded in the Clit syswhen certain heights are exceeded in the Oils system Illustrated we have a simple mechine that has been found to work with ease, asfety, and reliability a motor is mounted at the top of a shaft or hoistway. The armatares shaft carries between its two bearings a driving shower around which the six cashes suspending the car are passed. One end of the cashes extended to the ear, the other to the counterweight, which moves up and down in guide rails at the aide of the shaft, and is equivalent to the weight of the car and its severage load. Directly below the driving shower in the car and the strength of the strength of the car and the strength of the the urring sheave win with it is it conduct to two half-turns. When the current flows through the motor, the armsture rotates and moves the car up or down as desired. When the current is cut off powerful automatic show brakes are applied to held powerful automatic snow oraces are applied to note the driving sheave A compensating cable in older installations a chain is connected with the bottom of the car, extends to the bottom of the shaft, passes or one car, extends to the bottom or the shaft, passed around sheaves or pulleys, and then extends to the counterweight Its object is to compensate for the weight of the supporting cables, whether the car is at the lop or the bottom of the shaft. In other words, at me top of the honoroom of me same. In other words, the system is very nearly in equilibrium, and the function of the motor is merely to move it with such additional iond as is supplied by the passengers in the cars. When the Metropolitan installation was considered by a board of elevator engineer it was reallised that this system was the only one that would

alised that this system was the only one that would meet the conditions demanded in an office building of satterns height. The thorough tests which the machines have received since their completion has justified the engineers in their selection. The Tower installation, while is quite independent of the elevator systems serving other parts of the hang Metropolitan Building conduits of all expenses elevators, which make no stope between the street and the label of the conduits of the service of the 10th floor The cars are arranged in the center of the tower in two banks or rows of three each, for of the six running from the last in the 4st flow, or of the six running from the last moment of the 1st flow, as a rise of 124 feet 11½ inches. The middle car on the temperature of the 4st flow, while the middle car in the west bank runs from the basement to the 4st flow, while the middle car in the west bank runs from the basement to the highest landing in the tower on the basement to the highest landing in the tower on the 44th floor, a distance of 585 feet 1½ inches. With a 1st lead of 2,500 pounds, or about 15 passempers, the last lead of 500 feet per minute without care can make a speed of 600 feet per minute without stop, which is the maximum permitted by the premitted principles. These stop, which is the maximum permitted by the premitted principles of the 1st flower concerns that flower the 1st flower concerns that flower concerns that flower the 1st flower concerns that flower concerns that flower the 1st flower that the flower concerns that flower the 1st flower than 1st flower t the journey to the top floor consumes but a few sounds under a minute which is recognised as about t the journey to the top noor consumes but a raw sec-onds under a minute which is recognized as about the limit demanded by office building resting conditions. The actual consumption of time by the passenger The accuta continuity of time to the passage over lower hulding, where alover speeds and frequent stops may require the same expenditure of time. In this connection it may be remarked that the trunction machine illustrated can accelerate from a step to full speed in from two to three seconds smoothly

duity a total chaineau of his for the mines of the engineer nebrandly contents for the engineer nebrandly contents for the state of the state of the engineer nebrandly successful to the total content of the engineer of the navy machinery. Mayetor installation was not a final feet

construction of the tower, but an ever-present con-tion. As fast as the structural workers completed tion. As fast as the principular workers completed the framework, the rails for the care were set in Stock, and a temporary elevator was rigged to send by the materials of construction. As the materials for the five machines for the elevatory running to the fills floor could be carried up by the high-rise elevator, their erection was not so difficult a matter When It be-come necessary to raise the materials for elevator No.2 came necessary to raise the machine for elevator No. 1 up to the 65th story, a perious problem was present. Breatmaily, the teak was accomplished, and the huge cartiags and armature were sent up to a point where they could be set in place by an ordinary tackle. These machines, 1500 periods some for two elevators where devices are employed to enable active heart of the controllers weigh 5,000 and 3,300 periods respectively for the two classes of machines. It is here that the operation of the switches governing the motors one-true where the controllers weigh 5,000 and 5,000 periods respectively for the two classes of machines. It is here that the operation of the switches governing the motors one-true which switches are made the control of the sar

The motors are rated at 40 horse-p The motors are rated at 40 horse-power and use in Total direct current. They run at a speed of from 55 to 18 revolutions per minute, and the peripheral vicelity of the driving shawes on the armature shaft gives the speed of the car. The limited space in a thigh tower presents problems quits different from the tower of the car. The limited space in a thigh tower presents problems quits different from a remarkable of the speed of the car. The limited space in the strength of the speed of the spee

Around the driving sheaves pass the lifting and counterweight schles, at it is number for each machine. They are % of an inch in diameter, and each chief has a breaking strungth of 28,000 pounds. The length of the several exhibes for the various care varies from 575 to 624 feet for the high-rise car Another important cable is that passing through the cut to the cutrifficial speed governor at the lop of the batchway. These are %-inch cables, and they vary in length from 1144 to 3.21f cheef. Their frontion is to transmit the Around the driving sheaves pass the lifting and 1144 to 1,274 feet. Their function is to transmit the motion of the car to the centrifund governor, which is case of excess speed, not only cuts off the power, but causes the astry device of the car to come the play and lock it firmly to the rails. The cars, which vary from if feet d luckes by 8 feet 4 simbs to 844 inches by 8 feet 4 simbs to 8.4 inches by 8 feet, weigh about 6,000 to 4,000 pounds such. The counterweight is slightly heavier than the empty can be that the car is assumed to carry an average.

such. The counterweight is slightly heavier than the supply any so that the car is assumed to carry an average of the control
The Suez Canal is quite a different eight to-day from what if was when it was opened in 1969. Mr. Vice-Consul Duning gives same tissequities; detail of how the conal like these divisions to mind the translated

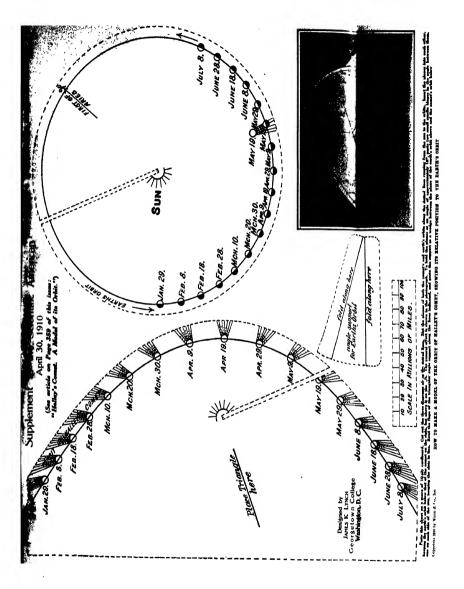
And the second s

Buckenum,
The lay mind is act to consider the advances made
in surgery in the last decade of more importance than
those in modern medicinal practice. That this popular impression is erroneous is proved by the imany lar impression is erroneous is proved by the 'finance' date years been put to supersective which have of late years been put to supersect ful tests to smake a physician to examine with the greatest eccurrey the workings of inner organs and to restore them to their normal condition without recording to the surgeous's kinds. Notable forward satisfies in this direction have been made in the study of the dispatch organs of the business body man to the work or the surgeous's kinds of the dispatch or supersection of the dispatch or supersection of the dispatch or supersection of the dispatch of the dispat and we down into the stomach, to init any estimate per manuse up again for examination by chemical reaction tests, to determine whether the stomach digests normally or abnormally, and thus to enable the physician to diagnose correctly the defects or discusses of the di-

From the New York Medical Journal we im From the New York Medical Journal we learn that Dr Mass Hilbson, professor of medicine at the New York Pend-Graduate Medical School, has succeeded. In the Medical School, has succeeded in the American School of the Company of the C

which instrument is introduced into the shootequary by way of the complainers and stomach without the life way of the complainers and stomach without the life is will known that primary direction takes place in the stomach discharges by way of the pylorus, and which also receives the very important into which the stomach discharges by way of the pylorus, and which also receives the very important control in the control in the pilots. For the purpose mentioned, Dr. Rithours uses in the pylorus, and which also receives the very important property of the pylorus in the interest of the pylorus in the interest of the purpose mentioned. Dr. Rithours uses in the stomach discharges the scribe along in its descent, the tube being sefficiently long to extend a distance out of the patients mouth. The capsains in the stomach, dragging the feetible along in its descent, the tube being sefficiently long to extend a distance out of the patients muth. The capsains in the stomach of the pylorus has beginning of the small intestine. The cuter as the beginning of the small intestine. The cuter and of the tube is then connected with a small other and of the tube in the stomach of the pylorus pilots and the pylorus has the declared accustant are drawn into the pilots have been along the pylorus that the declared accustant are drawn into the pilots and the control of the pylorus betch latter is now distance, and the pylorus character of the pump, which latter is now distance and the pylorus character of the pylorus which latter is now distance, and the pylorus character of the pylorus which latter is now distance, and the pylorus character of the pylorus which latter is now distance, and the pylorus character of t

The successful use of the simple device described has led Dr. Rimberg, to the represe use, that is, it involveding food or insidiction (directly link the described food or insidiction (directly link) the described food or insidiction (directly link) the described food or insidiction (directly link) and the confidence of the confidence of the confidence of the food of the described food of the described of the preference of the confidence of the confidence of the preference of the confidence of



The state of the s

In the letter referred to are sketches illus in the letter referred to are sketches literaring the five and thereign the same in compartors with a bird in the act of hight. The whole thing was submitted videous tar shorouncy notive and was simply for all the same of the same and the same of the same are stream of a visition I submit the foregoing in the loop table you will publish the same as it may light be experimentation. However W Matterwa Rack Haven, I

legal to experimentation. However W surrainves (Acade Hawas, Pa. Marchander, Mr. McChaere is letter in the issue of April 8th examplifies an error only toe common among people who take an interset in servojanes. Placing the center of gravity leve in an esceptaine introduces many objectionable statement which more than outwelpt its advantages. Placing the single special provides the server and calls for great skill on the part, of the arriser to maintain an apright portion. This is due to the predum effect of the supended weight. When the proposition strength is conferred to marchine by increasing its forward thrust it is excepted by the incretal due to the marchine weight increased the machine will the provide acceptation the machine will try forward. Lifewise on a turn the suspended weight funds to swring out in a larger circle than center of the supporting surface where the resistance is concentrated and so tends to depress the inner wing just the contrary of what Mr McChaer assume would take place. This disturbing tendency is in addition to the depress that the surface of the supporting surface analogies to asturate forms have much that he good in them and like him I have the monophase but I believe that assurant forms have much that he good in them and like him I have the monophase but I believe that assurant forms have much that he good in them and like him I have the monophase but I believe that assurant forms have much that he good in them and like him I have the monophase but I believe that assurant forms have much that he good in them and like him I have the monophase but I believe that assurant forms have much that he good in them and like him I have the monophase but I believe that assurant forms have much that he good in them and like him I have the monophase but I believe that assurant forms have much that he good in the man distributed the contract of the man and the him I have the monophase but I belie

THE "RIFES" IN THE REGEOS SAIR To the Editor of the Schenisca American The texture of the hair is one of the physical vari

THE "ELEMB I IN THE RESIDE ALIA.

The heature of the Sentrum CALEMBAN The testure of the Sentrum CALEMBAN The testure of the Sentrum Cale of the physical varieties differentiating the sager form the Angel-Saum Calt or Twetonie races. But what causes the kind in the hair of the sentry low can see that the same care have limited in the deam forest and beat of the torrid some of Africat the atmosphere of which has been enroharged measurements are the same calculated the same cannot be a mad other chemical substances. Be sides these and other known metals the atmosphere has in it various gases which it holds in suspension in the presence of these amnopular to a substances coupled with a constant very "humber of the same photonic substances of the same photonic substances and the same photonic substances are substances coupled with a constant very "humber of the same photonic substances and the same photonic substances and the same photonic substances are substances of the same photonic substances and the same photonic substances and the same photonic substances are substances and the same photonic substances are substances and the same photonic substances and the same photonic substances and proliferance and the same photonic substances and proliferances and substances and substances of the same substances and proliferances and substances of the same substances and substan

Betweethic American

The heat presented by section of the integraments of the skip in the present of the atmosphere tends to skip in the present of the atmosphere tends to rien the outer shouth of the hair and gives to it

nation the order should of the bair and given to it in permanent character. In the imagnerith noise of the United States where It is been permanent to the imagnerith noise of the United States where the humshifty of the aimosphere is not so should impregulated with metallic compuseds and gaseous substances and where the Afro-America and head and easily new protected by the certiliary being and sear reserved also from beneath the direct rays of the territy in proposal of the territy in the control of the certificity of th St. Paul. Minn.

HALLEY'S COMET -A MODEL OF ITS CREET.

For the large number of people now interested in the famous Halley e comet who have found difficulty in obtaining an intelligent idea of its motion in space its apparent motion in the sky and the times of its visibility a cardboard reliof model like that of which a photograph is herewith reproduced will be of great assistance. And even those who already understand the phenomena from the study of plane diagrams may obtain a much clearer idea of them from the model because it is much more concrete and represents the sun and the orbits of the comet and the earth as they really exist in space and not as they are often show

really crist in space and not as they are often shown by being projected on the same plane. In order that the readers of the Scruvrino Awrat can may easily construct such a model for themselves patterns or diagrams are printed on the secompany ing loces-leaf supplement which when pasted on card board cut out and properly fitted together will make an excellent model

After teiling how to construct the mo

Arter testing now to construct the model some de-scription will be given suplaining how the artronomi cal phenomena may be studied from it Having first pasted the icose-test on a sheet of card board about 10-pty cut out the three diagrams along the dotted lines Also cut a narrow slot through the the coviced lines. Also cut a marrow slot through the planes of both the comets and earths orbits at the places marked. Then insert the planes into each other as far as the alots will allow keeping the earth a orbit below that of the comet on the right but above it on the left.

If the two planes are correctly fitted together they will now produce the general effect shown in the pho-tograph But besides having the model rigid the two

tograph. But besides having the moder rigid the two planes must be given the necessary inclination to each other of approximately 18 degrees. The state of the planes together peating two must. Parties the two planes togethers peating two must be all the planes together peating to the contract of the sum keeping the slotts in time. Then bend side of the sum keeping the slotts in time. Then bend side over the finge of the triangle along the two lines marked on it peats it as a wedge between the plane of the sum of

indicated at intervals of ten days before and after perihelion as it travels in its orbit in the direction of permental as it caves in its orbit is the direction of the arrows. The earth's position as it yearly moves about the sun in the opposite direction is also shown for the same days. The printed side of the model

Examining the comets path in space we see that

manufacture the counts path in space we see that the through the plane of the electric at the second ing node symbol 2 in January On April 18th it was at perfision On May 18th 18th it cuts through the plane of the ecliptic at the electric at the support the plane of the ecliptic at the descending node Daring the early part of the year the counts and the sards part of the year the counts and the sards part of the part of the count givey brighter only by a change in its intrinsic littlinary. Now however the orbits are rounding including the count of the proposition of the proposition of the part of th

The time of viability of the comet will depend on whether it is the left or right of the san as seen from the earth. To transfer correctly to the sky left and right on the model we should imagine the sen on the merdida at soon with the comet to the left or right. Taking the way that common observation shows the sun to move across the sky from each show the sun to move across the sky from each of the servation o

anything to the right at noon will rise and set certier than the sum. Hence before he comet being to the Hence before March 28th the comet being to the sit of the sun rose in daylight but set after the sun and was visible in the evening At present it is to the right of the san and rises before it in the morn-ing increasing its distance until May 8th when it reaches its greatest western compation it then ap-proaches the sun and cross into inferior conjunction of May 18th 18th

As the three celestial bodies are also in the saw plans on this date the olreumstance makes it possible for us to go through the comets tall if it is long for us to go through the comes tail if it is long senough to reach us What we shall see on that night it is not the purpose of the present article to consider but it may be said that as the moon is then approaching full a fact which has been somewhat overtooked we may not see anything at all.

The comet and the earth are fourteen million miles distant May 18th 19th but their closest approach or

custant May 18th 19th but their closest approach of curra a day later when they are thirteen million miles apart. The closest approach of the orbits is at a point a little below to the left where the comets orbit is six and one half million miles below the earth s. On diagrams where both orbits are projected to plane they apparently intersect at this point as some people have imagined a possible collision here but the orbits never intersect as the m

On and after May 20th as the omet is to the left of the sun in the model it will again be visible in On and arrer may you as an of the sun in the model it will again be visible in the western aky birg seen as soon as it is dark enough and setting about two hours after smast which time will gradually increase 1) four hours by which time will gradually increase 1) four hours by the end of May But as the low lodies are then re-ceding in almost opposite directions and the tail is turning more and more away from us the giory of Hallor's comet will soon be lost to us for three-quar tors of a entury

The (urrent Supplement

The current Rapplement
The new 601 in An fell tel age of the Mount
Wilson Solar Observatry has be a in o y ratin for
now 100 solar Observatry has be a in o y ratin for
about one year. A d a right in of this wenderful in
atrument and the work which it does in prevent
in the current Stryrayers No. 15 ib by 7 h Sath
Sren Hedins big Trans Himslays. Is reviewed Hail
age was not only the first to predict the ret iran of a
comet hat also to devise a melhod of determining
that age of the ocean from chemi al denuation. George
P Berker con ments on his work. The ancient deel
and bood frate is still in actual ass side by side with
and bood frate is still in actual ass side by side with mai beed frat e is still in actual use side by side with the very latest adding and listing machines. This ancient beed fran the Chinese abscus and its Japan ese twin brother are described by Mr. Daniel Arthur eso twin brother are discribed by an america around the supportion. Henry A Wise Wood contributes an excetiont paper on Mod rn hereoly; y and the Mechanics of the Newspaper Sinstitut a for Rubber. chanics of the Newspaper Sistitut a for Rubber is the title of an article whi h musi undouitedly at is the tree of an arriver with most outside or tract attention be ause of the present rubber boom Under the title Mechanical Oddities some ciri is in ventions are des ribed. The design of a roplane motoris is discussed. A Meilin suggests an improvement in aeroplanes. A box with a secret of sing is deecribed and lituatrated

Marcury Are Patents Granted

After six years nest Mr Potr Cooler Hewitt has been awarded patents for his mercury vapor elec-tric lamp. The patents have been in interference since the date when they were first as piled for Mr Hewitts chief opponent was the General in 1901

In accordance with the recent decision affecting classification of articles under the Lariff Act of 1909 the United States Treasury Department has instructed customs officers to admit free of duty all miners easions officers to admit free of duty all miners nately lang whether elvire of estignate for using oils or other lituminating materials with or without glass chinneys and whother imported as an entirely or in separate parts togother with any apparatus for locking or unlocking such astroly lamps for testing or desceing nave in these image or for cleaning them of data particles of together with all mit recover appliances and the superior of the complete of the property of the complete particle of the complete of the complete outflet, whather imported as suitretties or the superiors parties.

MOTOR-BOAT RACES AT MONAC THF.

BY THE PARIS CORRESPONDENT OF THE SCIENTIFIC AMERICAN

The motor best races at Monaco and Monte Carlo The motor both races at Monace and Monate Lario this y as wer noteworthy on account of the extremely high upod which was sitained according to the cable dispatches there were a more or more of boats in the races which were two-red with excellent weather

and a half astonished many of the speciators, and was an excellent testimonial to the design and con struction of the Wobsley-Biddeley motors that drave her She was piloted by her owner who steered her with great steadiness. He took the turns with-

gree of necurrery is obtained, and an experience has shown that in a long-flistance race a loud will make less apeed if anything, than in a short speed trial, it seems certain that the Ursula' has not shown much more than 40 miles as hour so far. That she should





Stern of the "I freely," showing radfor and twin a

Three of the contestants making a turn in the "Championship of the Sea" race

sible the attainment of great speed on-

Three of the centestants making a turn i that make possible the attainment of great speed expe inity in the long-distance revents. The first long distance race for the Championship of the first was the distance race for the Championship of the first long distance race for the Championship of the first long distance race for crust at a question of 2.51 miles per hour Out of the 32 couped in so in the long distance race for crusters the Championship of 12 couped in so in the long distance race for crusters the Championship of 12 couped in 12 couped in so in the long distance race for crusters the Championship of 12 couped in 12 couped i shows the twin screws of the Unusa. Her chapters are arranged side by side one on each side of the bull Another photograph shows the Ursuia at full my d white a third it ture shows the Brasier Despujois The difference in the amount of spray thrown by these two boats is interesting the former. carrow by these two locate is interesting the former cuts through the water with very little disturbance while the latter skims over it with a good deal of apissahiny. The great 1: helarity with which the Ur-sula speeded around the course for nearly an hour

out slowing down and at each tarn the beat would the dangerously. The Ursula showed hereaft to be one of the fastest motor boats that have over bru built built in the mile and kilometer speed trials she did not make anything like the time that she is reported to have accomplished in the long distance races in fact, the hydroplane best her in the speed trials owing to its ability to get under way active. The time of the mile from a standing start and of the fivine of the mile from a standing start and of the fivine of the mile are follows:

			Miles
	Mile	Kilometer	an Hour
Braster Despuiols	3 20		25 71
Brasier-Dospujols		50 3-5 sec	44 26
Ursula	2 26 2-5		20 00
Urenia		55 2 5 sec	40 81

The Urusia this year is fitted with the same two 13-cytinder Wolselwy Hiddeley molors that were used inst year. As her best speed then was about \$7\$ miles per hour it is fair to saesthe that the figures tree in the cauble reports are not correct or also that the distances around the course were less than that the distances around the course were less than that the distances around the course were less than that the distances around the course that this figure is the long race especially since abe made only 403 miles as hour in the fying kilometer speed trail We understand that on account of the great depth of the water where the race are held thors is often times a shifting of the boury owing to the inclinations as shifting of the boury owing to the inclination of the course. The mile and kilometer tests are therefore the only once in which any great de

have averaged 48 miles an hour with the same power plant as heretofore is very creditable

An Acroplane Flight with Five Perm Cross-Country Flying in France.

One of the most remarkable performances ever mad with an aeropiane was that of Roger Sommers ne biplane last work in France when piloted by its com sipane last work in France when piloted by its own structor it carried him and four other persons in a five-minute cross country fight. On this occasion the astropiane lifted some 750 pounds of dead weight or probably a total weight of 3 800 pounds with presuma-

probably a total weight of \$100 pounds with presuma-by a 60-large sover motor.

Apothas demonstration of the-development of the however than air machine was given in April 1816 by Lonis Itsulhan who few from Orieans to Archevita-table 113 miles in 134 hours on his Farman birther. Ashe (118 miles in 134 hours on his Farman birther. The next day he few 44% tules farther across country in 1 hour and 10 minutes reaching a height of 184 to Henty Farman on the 17th hastant also few 40 miles

renty Farman on the 17th instant also flav 60 miles arross country with a passenger. These brilliant flights form an ocular demonstration of the great advance recordly made in dynamic slight, and point the vary to the pre-total utilisation of the seroplans for the transportation of individuals and of mail

The Electrical World states that at a re-The Riccircial World states that at a recent interest coveration in Indianapolis the opposition of mine workers to siective power the introduction of whice workers to siective power the introduction of which they consider angularist their interests was manifested in a resolution declaring that the use of electricity in mines in hazardone as the leadings from poorty issu-lated wires has a tendency to ignitis whine pisses and frequently consider explainters.







The Dube of Westminster's "Unrale" to ا الله اللية بيسة في المالية من المجانة والمراجعة المالية المالية المالية المالية المالية المالية المالية الما المراجعة المالية المال

FHE MANUFACTURE OF CELLULOID

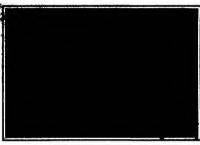
BY JACQUES BOYER

since than sixty years any chemists began the search vire substances of which initiations of horn tortoken shell, and irroy could be made. One of the first explanations of the property of the second
It caster oil was added to the mixture and afterward the applith was replaced by methyl alcohol Parke-sian obtained a temporary accesses in Binghand that the wastern out of the market by the obsepter coils id the manufacture of which was begun by the Hyatz brothers. Understand was begun by the Hyatz brothers are the second of the second of the Hyatz brothers are the second of the second of the Hyatz brothers. The second of the second of the chillabed in America Prance have a very pure form of chillabed in America Prance Ragand and Garmany Collisions usually obtained from cotton or unissed fit for paper. The collisions is converted into afterwell lose by methods which very somewhat in different fac-tories. Among the precesses must commity used in the following. The material—new or span oction or

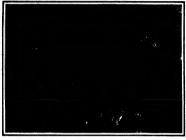
paper chopped or cut into strips—is immersed in nitr c acid for a jeried ranging from fiftee ni utes to two hours according to the chara ter of it has an cit in emperature of the lath. The sotton or paper now converted to the part of the strips of the sthering liquid which may or may not be returned to the literal part of the strips of

nitric acid

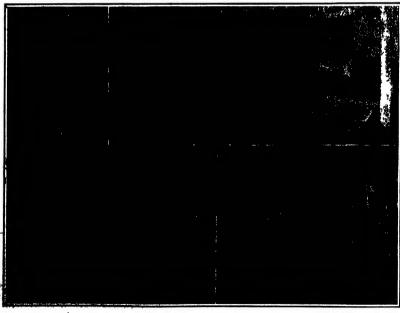
The nitrocellulose is washed in water and ground in
a paper mill in which a rotary movement is impressed
upon the mass as it is forced between a pla a d two
cylinders which rotate at a speed of 160 revolutions



Hending colluieté hairpine.



Blowing celluloid della.



'r Mailifed freibe of ergiger?

Rolling shoots of collulated. THE PLANTAGE OF CHILDREN

Outting out cellul id reds.

Selection Assessed

per minute. The cylinders are set with steel blades, parallel to the axis, and the plate bears a number of steel blades, slightly inclined to those of the cylin-ders. The finely ground nitrocellulose next goes to the blocachery, where it is treated with chlorine, hydrothe hieachery, where it is treated with chlorine, hydro-gen dioxide sulphurous seld, potassium permanganate and other decolorizing agents. It is then washed thoroughly, pressed between rollers, and dried Collutold is made by dissolving nitrocellulose in an

airchoife solution of camphor Some manufacturers mix the esuphor with the moist produ pressure which contains 40 per cent of water, while others add the camphor to the dried nitrocellulose in the locator case the moist pulp, camphor and color-In the first-own class the moint julp, camphar and color-off matter are ground together between horizontal, circularly fluid from "militations". The mixture is passed several itions through this mill, and is then dried. When the nitrocellulous is dried separately the illumps formed in the passeds through the order press are crushed by rubbing the pulp, with the hand through a coarse wire serves.

through a coarse wire across Drying is effected indirectly by pressing the pulp between layers of absorbent material. The pulp is aprend on a cloth which is turned up over it, forming spread on a cioth which is turned up over it, forming as retangular cake 24 inches long 20 inches wide, and about % inch thick. In the factory of the Société Industrielle du Celluloid these cakes are piled alternately with dry feits a sheet of iron boing introduced

nately with dry felta a sheet of tron boling is after each ten or fifteen cakes, in order to facilitate handling. Then pile is then subject to a hydraulic pressure of about 350 period in a hydraulic pressure of about 350 period in the hydraulic pressure of about 350 period in the hydraulic pressure of about 350 period in the hydraulic pressure and the operation is repeated until the nitrovillation is dry. The compressor cakes are now unwarped and backen into fragments for solution. If the campbot has been added before drying the camphor has been added before drying the broken cakes are simply sprinkled with al cohol, but if the dried nitrocellulose con-tains no camphor it is moistened with a sulution of 90 parts by weight of camphor

In 100 parts of alcohol

The solvent is allowed to act for 24 hours and then the mass is rolled between hollow iron cylinders, from 12 to 26 inches in di ameter, which make 10 revolutions per min atheter, which make 10 revolutions per inin ute, and are conied or heated, as desired by a circulation of cold water or steam in their luterior From 65 to 130 pounds of celluioid ar relied at a time the rolling being continued from haif an hour to sev being continued from helf an hour to several hours. Toward the ond of the opera-tion the sylinders are brought tlose to-gother in order to produce a thin sheet of exiting the sheet are converted into blocks. The rolled sheets are triumed to the cazed dimensions of the press, and the trimmings go back to the rolling mill. In the Champingseth block press a strong iron box 16 inches tong, 25 inches wide and

ick the presence of cellular to a light block by pressing between two from plates. The top plate is fixed in position, while the bottom plate is carried by a plunger which onters a cylinder below and is forced which others a cylinder below and is forced upward by hydraulic pressure of 250 (one is applied for a period verying from 50 to 1) source, during which the collusion is kept at temperature of from 156 to 1 below. It is a circulation of hot water in the interfer of the plates and the double walk of the for. The mass is cooled by substituting old for hel water the pressure being continued during the colling. The top plate is then removed and

the block of celluiold is forced out of the top of the box by again applying pressure from below

box hy again applying pressure from below.

The blocks are cut into bands or rods according to
the purpose for which the celluloid is to be used The bands are cut by a machine in which a knife, the edge of which is inclined 40 degrees to the horizontsi, is forced downward by a serew in this way bands varying in thickness from 1/250 inch to 1% inch can be obtained. Celluloid is cut into rods or fibers by a machine in which the cutting tool has the form of a short cylinder of diameter varying accord ing to the size of rod desired

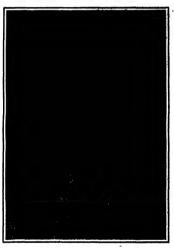
he celluloid, after it is cut up is dried in cham bers where the temperature is never allowed to excord 111 deg F on account of the danger of explo-sion. The time required for desicration varies sion 'The time required for desiccation varies greatly with the thickness of the bands or rods Bands thinner than 1/100 inch dry in a few hours while strips thick enough to be used in making knife ham dies, for example must remain in the drying cham her about six months.

Tubes of celluioid are made directly from the roll sheds in an apparatus which comprises two vertical cylinders, with their area in the same line and thair pictons sunnerted by a stout red. The bettern of the

lower cylinder has a central orthos, to which as apertures of various dimensions on he adjusted the lower part of the cylinder is heated by a of the orthogonal or the cylinder in introduced the cylinder and the cylinder has been part of the cylinder. the lower part of the sylinder is heated by a devisible ton of bot water. The callulad is fairnessed Side this cylinder and hydraulic pressure is applied to means of the sylinder above. The calluloid, settlened by the beat, is thus forced through the aperture the form of a tube, which the operator draws away and cuts into convenient lengths by means of a cleany attached to a cord passing our reversible pullup.

To return to the bands of calluided which have been cut from the presend blocks. In the drying chambers these bands become warped. They are Satisted in a hydraulic pollular press which searts a presents of hydraulic pollular press which searts a presents of

these bands become warpen. here are a pressure of about 1,000 tons. The cellular press which saard as pressure of about 1,000 tons. The cellular bands are piled alternativy with select of positible brans or nichelyades ready and the same piled alternativy with select of positible brans are piled alternativy with select of the piled brans or cell water. While the pressure is applied the pintes centain channels for the other cases or cell water. While the pressure is applied the pintes are first heated by steam to 150 or 150 deep for a few minutes and are then cooled by cold water. When the bands are taken from the growth of the pintes of t



Pluttening celluloid hands that have warped in drying, THE MANUFACTURE OF CELLULOID.

be noted. For this purpose two blocks of celluloid of different colors are made separately in the block press and cut into bands about 1/100 inch thick. A pile of these bands, arranged in alternating colors, is alless with a powerful paper knife. The fine strips of colin

with a powerful paper laife. The fine stripe of cells-iold of two colors resulting from this operation are arranged regularly or irregularly in the block press and converted into a solid block of striped; valued, marked or "watered" appearance. From the bands, rods and tubes or plain and water-aried cellsines, objects of every form and character, researcing the appearance of youry, tortoics ships, heaves and other woods, corid, unber, jack, make, chile, silker afforts, etc., are made by reprise plain-tions, of which the most important are "happing, chile thing out modeling, cerving, blocking, variantificing and ting out molding curving, blowing, warn

ecorating.
Celluloid, like wood, horn and lvory, is a Collisiond, like wood, born and proor, is usually shaped by hand, with the chiefs, drywing latella, rusp, etc. Collisiond harr pring are potated, as the mean wived Shaning in doors also on the joint in they are wised that the control of the collisions are the collisions of the collisions of the collisions are the collisions of the col

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took becomes Writh and openies when handed for trongity.

Collisionic objects of the stranger variety of form and produced by modelles, in which openies, may be represented to a produced by modelles, in which openies, may be represented to the section in the section of the section of the section of the section in the section of the section of the section of the section tack with the basicle, plotters which which are increa-ted to collision has become sectionarily plants, the platies are forced together, and the collision and the section of the section of the model, which it readine afthre collision. Leaves, peaks of forwars, and similar small this ab-tent form of the model, which it readine afthre collision. Leaves, peaks of forwars, and similar small this platies of the section of the section of the section of the section. The operation of believe to performed on exhibited the section of the section of the section of the section which is cooked between section with force the objects, as well as dolls, animal games and other tory are made "The parts of aphighed beases and other built-up objects are summ-times joined by means of acctoric, section and or other solvents of culticial. Cleany with pursues stream, which are possible and with pursues stream, which are possible and with pursues stream, and a collect and of asti-pation of the section of the section of the section of a section of the section of the section of the section of a section of the section of

with pumice stone.

For decorating the surface of ceiluleic antiine colors dissolved in alcohol are est

Air Bosistance Experie A useful critical comparison of the work A sizeful critical comparison of the work, of Frank and Effel is presented by W. Schule in the Zeitschrift des Versiegen Deutsch lig. The law that realistance is preportionate to the square of the velocity has been verified by Frank for velocities up to 6 m./sec. and by Billel from 15 to 6 m./sec. and by Billel from 15 to second the provided and the provided area, and this proting to the provided to the normal area, and this proting the provided to the normal area, and this proting the provided to the pro

seistance does not reach its mixtures with an area of 1 sp. no (2016b). The results of Frank for right circular cylinders and comes of various agains are in contradiction to be on the side of Elital, and further, the resistance deduced by the latter from the experiments with inclined plates requires substantial correction. The resistance of an inclined plate increases very quickly with the inclination of the plate ny to be deg., and the side of Elital, and plate requires substantial correction. The resistance of an inclined plate increases very quickly with the inclination of the plate ny to be deg., and the side of the plate ny to be deg., and the side of the plate ny to be deg., and the side of the plate ny to be deg., and the side of the plate ny to be deg., and the side of the plate ny to be deglet of the side of the s

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***CHARGEMENT ALBERTON OF THE TOTAL TRANSPORT OF THE TOTAL THE TOT



Fig 1 .- TOOUS OF A LEES.

it is that for look through a large telescope would be disapportating, for nothing appears as hig or an anguled as expected. The beginner is as hig or large telescope and the second of the second of the large telescope and the second of the department of the second of this article is written.

this article is written.
It is sometimes thought that a telescope is powerful because the rays of light pass through a large number of leanse placed at intervals down the URD list idea, like many another popular one, is entirely erroneous. The telescope gets its power mainly from the objective which cansed the rays of light coming the object under observation to converge, and it not intervened form an image

The action of a simple iens is easily understood.
If parallel rays of light fall on the lens in the same in paraiset rays or fight fail on the lens in the same direction as the axis of the iens they will [Fig. 1) converge to a point F, called the principal focus, and similarly, rays from F will emerge as a parallel beam. F may be on either side of the lens, and it is imma-



Mg. S .-- PORMATION OF AN INVESTED IMAGE.

terial in which direction the light goes through The distance from F to the isens is the focal inength. Next, if we have a parallel beam not in the direction of the sais (Fig. 2). It will likewise converge to a point, directive from F II we neglect the thickness of the isens, a ray through the constor of the isens of will push through most studied, a ray is through 7 the forcas will ensure through the forcas of the isens of the isens of the interest from F and from the most. A will be brought to a form at a said from the most. It will be brought to a form at a said from the most of the said of the s

Three different ways of using the convergent pe

American

response are parist rays falling on the middle of a sim-ple less are brought to a focus at a different point from those falling on the edge of the less, as is shown in Fig. 5. The distance from F to G gives the amount of the "spherical aberration." Even more



TIE. S. ... SPEERICAL ANDRESTON

area had a great amount of color surrounding star images and a great amount of color surrounding them. A leas may be regarded as a round prism Since a prism not only deviates light but breaks it up into the spectrum colors, a simple leas will act as is shown in Fig. 4, the velocit light is most re-fracted and is brought to a focus at o, the less refrangible red comes to a focus at R, with rays of the other colors in between these two extremes. The reother colors in between these two extremes. The re-sult of all this is that if we force for the yellow, the ved and violet form rings around this and a star image is anrounded with a considerable amount of color fit least. Newton was the first to explain these abservations, and it is attempts that although he made experiments to prove that giass and water disperse light differently, he did not forestall Dolland's dis-covery (160 years ago) of making as objective from a combination of two lesses, one a double convext of the stars.

int glass. With such a combination the optician has four surfaces to figure, and as a result it is possible to aimest entirely eliminate the spherical aberration, or in others words make a flat field. But on the other hand it is still impossible to act entirely rid of color Fint



FIR 4 -CHROWATIO ANDRESTON.

and crown glass do not disperse light allie, the fitteriatively yieldness set the violet and the more from optician with glass of two different sorts at his disperse to the control of the post can bring two colors of the spectrum to a sharp focus. For a visual telescope the rays generally takes are the relieve and the bites green. Consequently both the red and the violet ends of the appetrum are not nearly point, and these form rings about the steinar image which combine to make purples color in small telescopes this color is not so promounced, but with large telescopes of 36 inches or more aperture with large telescopes of 36 inches or more aperture. It is all the colors as the "secondary spectrum."

The problem of making a good visual tens is ratify a much simpler one than that of making a good pholeand crown gians do not disperse light atike, the flint

The problem of making a good visual iens is really amost aimplier one than that of making a good pholographic one. In the first place, in the ordinary telescope for visual purposes, the field is comparatively small, of only a few minutes of are, and the process of making a field fast over the area is simple compared with that required in an instrument life the Bruce pholographic telescope of the Twekes Observatory, which pholographs an area in the sky 15 deg square. With structuring the decomes the ratio of agenture to focal length is about in the ratio of 1 if (the article of 1 if (the contraction) of the real contraction of the ratio of the real contraction of the rea of nearly 1 . 19). In a photo



PIG. 5.—COMBINATIONS OF LENGTS FOR RAFID PROTOGRAPHIC WORK.

for the portrayal of a comet, for Instance, as short expectures as possible are desired, and this calls for an great a ratio of appricar to focal heapth as possi-ated to the standard of the tags of the standard of the sta

field from a lens with an aperture of 1 δ is impossible with only two lenses; three or more are necessary Using gains of different indices of retraction on the control of the control o

Every skiliful amateur knows how to test a photo-graphic lens. This is perhaps done as well as any other way by the test cards for artigmatism, to see

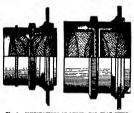


Fig 6 -- COMBINATIONS OF LENSES FOR FLAT FIELD AND ABBRECE OF COLOR.

If straight lines which intersect at right angles be-come lines or blurred images at the edge of the field. Still a lens might answer all the requirements for ary camera work but be a poor astronomical le A camera might cut clear to the edge of the plate on ordinary work, but when a three or four-hour ex-posure is given on stars all imperfections will show up Unfortunately, for obtaining astronomical photographs a telescope mounting with a good driving clock is indispensable—which is usually out of the reach of most amatours

On the other hand there are a number of small vis

On the other hand there are a number of small via usal telescopes in the bands of ansaturs, and a few words might be said in regard to testing thom. This is best done on a moderately bright star. Fous car-fully on it. Push, the cycylice in slowly and note the fully on it runs, the species in a source of light does not remain circular, the objective is not "squared on properly, or the objective may be pinched in its reli This must be adjusted before anything more is done Now pushing the eyepiece in, the colors should



T -- WORK OF A RECTILIBEAR LENS COMPARED WITH AN AMASTICMAT BLURRING DUE TO ANTIGMATION IN RECTILIBEAR LENS. Fig 7

change gradually and symmetrically as the disk of light enlarges. The same should hold true by pull ing the expelsee outside the focus. If the telescope behaves well from this test, turn to a double star behaves well from the test, up to a counter sac like Castor As the amateur becomes familiar with the heavens, be will soon learn test objects for his telescope, and if he possesses a good instrument there is no keener pleasure than trying it algula after night and becoming familiar with the beauties of the heav-

POWDER PLATING OF METALS.

Before a meeting of the Royal Society of Aris, in London last January, a paper was read on an im-proved method of electro-plating it described the process of plating metals by rubbing them with a moistened powder, and a number of articles work The new plating powders are not to be confused with plating preparations which have been in use heretofore plating preparations which have been in use an exectors and which set merely to exchange the surface metal of the article to be plated with a thin film of deposited metal. In the new process a truly electroly, it action takes place which results in the deposit of metal without taking away the surface metal from the object to be coated Furthermore the deposit may the object to be coated. Furthermore the deposit may be made as thick as desired by continued applications of the powder. The inventor of this plaining powder began his experiments a number of years age, so with a view to developing a process by which knives first symons and the fifte can be plated as results as they can be cleaned with policiting powders, and he sue models in deviating a nuclear by which almost any metal and even certain alloys such as brass in various proportions of copper and sine can be applied to metal objects. Bo far the new powders are not n the mar-ket in this country but in England they are sold in small cans for a shilling each and one can is suffi-cient to plate the nickeld portions of a hicycle or to

ant to plate the nickeled portions or a management at a quantity of houselold silverware.

The powders are comjos d (1) of the motat to be motated to be motated to be motated to be motated to be motated. diposited in its of mentary state (2) of a salt pre f rable a sait of ammonia and (3) of a powdered f rably a sait of ammonis and (3) of a powdered metal which iss it to d positre to the metal which is to d positred. Magnesium is the most letro positive metal with it is commercially prac-itivation use and in narv of the preparations attun-forrs is a tive to it il ment in asome of the prap-arations atuminium and sine are used. The follow into formula travet the size platting powder.

/Inc	I' parts by weight
Ammonium suiphate	5 parts by weight
Magnesium	1 part hy weigh
Chaik	10 parts by weigh
Scapstone	2 Γ parts by weight

Ordinary comm relatizing dust oven though it is not perfectly pure may be used. This same formula may be used for my rai oth ; metals if sliver be substituted for the zinc in this formula a very heavy substituted for the sine in this formula a very heavy deposit will be obtained which will have the white frosted appearance of allver electroptating before the problem of the substitution of the size the deposit will be a light-yellow but various shades down much the state of the size of the posit will be a light-yellow but various shades down routs. The entite which is to be plated with the powder does not have to be cleaned before the powder and ilberates the oxygen of an oxidized aurinous. The entitle who while the oxygen of an oxidized aurinous for the size of
MAKING MILK ARTIFICIALLY

ST 1 / AREAS

We have heard so much about the synthelic production of performes syrups dyes and what not from coal tar products that we are not easily surprised by coal tar products that we are not easily surprised by the information that milk may be artif faily made. The m thod described below however is not a chemi cal one hut consists merely in the mechani al admix ture of distilled water with crushed and finely ground sweet almonds Practically the only difference be tween cows milk and that made of almonds is that cows milk contains animal casein while the artificial cowe milk contains animal casefu while the artificial milk contains repertable seator. The inter will produce a good supply of cream and if allowed to stand some time will become sour it may also be cased lated by the addition of vinegar or scelle acid. When combined with grape sugar it is capable of grounding some extenordinary organic substances. The artificial milks who have different to the same way that cove a milk is used.

way the cow a milk is used. To make the milk protuce half a pound of sweet simends—the Valencia which is cheaper than the Jor dan aimond will give just as good results. The skin of the aimonds may be removed by scalding the nut in boiling water and pevling them with a sharp knife. The aimonds should then be placed in a wooden they plug bowl and chopped as nively as possibly. Take about two ounces of the chopy of aimonds and plack. them in a mortar with a small quantity of distilled them in a mortar with a small quantity of distilled

Scientific American

may be squeezed through the cloth by wringing it gently as shown in one of the illustrations, but care should be taken to prevent any of the larger almost particles from being forced through the meshes wi

particles from being forced introduct in set measure we for the control of the multi-thus produced in set saids for three or four hears a thick layer of cream will be found on the surface of it to much water has been used in ferming the smilt it may be necessary to add a little sugar of milt to sweeten it. The artificial milk has a slight almond favor when takes elser that it is not set to the size of the said of the size
SOME EXTRAORDINARY DENSITIES

BY IS Y GUSTAYS BE SA I C STA BE A STATE COLLS & Pi k up any common heavy stone such as granite or compact limestone Lay it at the bottom of a vessel filled with a fluid transparent liquid Common ase tells you that the stone will stay there



A COMMON REATT STORE PLOATING IN A GLASSWEL

chemistry tells us that if the liquid has b

chemistry felia us that if the Itsuid has been selected for such a propose the stone will spring up to the surface as if it had been forced into marrory instead of being immersed in what seems to be water. Liquids which are denser than glass marble or common stones are not numerous Leaving saids the metals surceury and gatition and the metalloid but metals surceury and gatition and the metalloid but metals surceury and gatition gates the surface in the surgeon scientists of the surface in the surface of the surface in the sur

I the most better than the control of the way and a state of the control of the c 1 I bergete cente

ng densities.

the list of some senses arranged according to users.

Such actives differences in deality are not found from the control of th

Intense stanch of that well known antisoptic is 197 times heavier than hydrogen When some incidedwin is vaporised in a porçelain dish placed over an about or gas lamp it is partially decomposed 1900 waper is set free and remains mixed with indeform waper as the set free and remains mixed with indeform waper as indice vapor is tested in a vapor as indice vapor is the heaviset of gases the experiment remains very beautiful if the air is quiet a lateral jerk prine to the dista causes the layer of violet gas to esciliate heavily just as a liquid would do in minital criemmissances

A SMALL REBOTRIO FURNACE,

A GRALL RIADTREV TREAMS.

The accompanying cut shows the cross section of a small electric furnace made from a description of the Moissan furnace. In this one the brick and lime cut year replaced by a block of limeaces about 5 x 5 x linears. In the top face of the base is hear a curvity reverse the cortex of the base is hear a curvity reverse the cortex electrodes.

The cover is a similar stone with a carvity hear at its lower face. Both base and cover about the benome that he had been a curve to the cortex the cortex of the cortex electrodes. The corver is selectrodes. The corver is selectrodes by the context the stones. The carbons are variabled by means of the stones. The carbons are variabled by means of the carbon is the carbon of the carbon of the carbon. This change is attached to the lever at one place only. This along is attached to the lever at one place only.



A SWALL BURGING VICENAME

ontal movem sumcuent normanial movement. The electrodes are connected to a lantera circuit (alternating current 312 volts) by means of clamps. These clamps and other metal work are made from sheet aluminium—easy to cut and easy to shape. The botts used are short store

In such a contrivance calcium carbide calcium phos-phate phosphorus brass and alloys are easily pre-

pared Calcium outside requires intense heat, the cavity aboutle to small. Gas carbon or powdered are light carbon to best to use Calcium phosphide is prepared by heating calcium, catife carbon and red phosphorus. The phosphor is pinced in first in small quantities this is covered by the other ingredienty well missed and universed Some kinds or animal charcogi and calcium grides will produce calcium phosphide.

Phosphorus is prepared as directed in Newell by heating a phosphate. charcog and mad Phosphorus is propared as directed in Newell by

Phosphorus is prepared as directed in Newreu up heating a phosphate, charcost and same Proppherus is separated and burns at the top It acmediane such lines on the faces of the stones and burnts take figure when the cover is litted. The gians the size years in in the furnace. This is exceedingly bod. Pleases of porcelain are easily melted when youlded into this plan-

the mass is easily made by heating since and comme, The stones may be obtained from the review heap of a stone cetter's. The current of his cid my will purely a good teaty-maint for cetting the property of the ficked Reference and



Chopping the almonds.

Grindian the almends in water. MARING MILK ABSIFICIALLY



Filtering the almosa milk.

vater Then grind or ievigate the chopped almonds adding water occasionally until about twolve onness of water have been used. The longer the grinding is continued the this is and ishore will the milk be Now take a piece of chiese cleth about 12 inches wide Now take a piece of these cleth about 12 inches wide by 24 inches long and rines it in clean water and after wringing R as dry as possible told it double over the tap of a pitcher and pour the campanty'ef the mortar through the cloth into the pitcher The milk the sorting of oree and other minerals as in most rases useful or precious stones only will go to the bottom of their solutions. Their price however (the saturated solution of endsium tempercherals is sold two cents a gramme) will five some time to come pre-chade such an application. Solid almostinum research on the surface of such liquids. To see a metal feeting over a watery field is however no sure speciated for the chemist, overall

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not thinking of taking a Surspens trip will find the best of the utmost value as a ward of reduction.

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ď	BALR-TIN MACHINE. J. A. SCHARF, Rich wood, Ohio. An object of this improvement is to form a machine which will perform the	Buz Ree Mall box. Dut blank making mechine R. C. Stande S.S. T. Birske besm. O. H. Wiltzans, Jr. 1903, 239 Birske besm. R. U. Walch Birske besm. R. U. Walch Birske besider, paint, O. H. Jorey 803.6 Birske besider, paint, O. H. Jorey 803.6 803.6 803.6 803.6 803.6 803.6 803.6 803.6 803.6 803.6 803.6 803.6 803.6 803.6 803.6 803.6 803.6 803.6	Merator safety device (1 J Percentus 165,425 El Klerator safety device (1 J Percentus 165,451 El Klerator system, Shertrohydraulic E. 3)
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u." I	the passage of the gas and an interrupted passage for the electric wires, to permit of conveniently threading the electric wires in the links of the chain and to give access to	J S. Muchie 035 e Caster, E. H. Humphrey 963,10 Cellar storm and refrigerator, D K Harry 855 7	three by M. Most! 18. W Forgue 18.5 SB) Three doughout B. W Forgue 18.5 Srf Phasel L. N. Ritte 18.5 Srf Phasel L. N. Ritte
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ine	Norn.—Copies of any of these patents will be furnished by Munn & Co. for ten cents each, Please state the name of the patentee, title of	Olivait closer, il II (etter 905,5	tings. See Rule gage tilage W A. Lomax 855,175 (inructot closer O. Biscokramer 855 637
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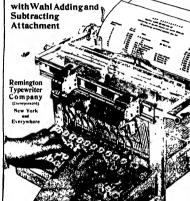
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of over forty miles an hour
The significance of this realty wonderful race b tween Paulian the Frenchman, and While, the Englishman is apparent only when we consider some of the details which have been cabled to this side of the That Paulhan should have wen the \$50 000 prize in such superh style at the very first trial is tribute both to his own skill in manipulation and to the excellence of the Parman biplane with which tho race was won, but to appreciate the full significance of the race, we must remember that both or and particularly White flew for a considerable stretch of the journey at night time and what is of even more importance that they did not healtate to make both the assent and the descent in the darkness. No stronger evidence than this could be afforded that the according is an instrument of mecision which can be relied upon to answer with certainty to the control line hand of the merster

is something strongly suggestive of bird flight in the description of the manner in which one the contestants after leaving the ground swept through the air in a wide thele in order to get the my of the land and the proper direction of flight or to p'(k up again a course from which he had been driven by the wind But certain) the most difficult feat of all was that of making a landing at night time in a forality with which the aviator was quite max-qualored and where he had to make a wide delour looking for a suitable stretch of unobstructed surface

Last year in commenting open the status of the art of flying we pointed an that the one last obstacle the provided achievements was that of successful starting and alighting upon the average surface which would be encountered in cross-constry flying and per forming these feats with certainty in a breeze of or dinary strength The London lo-Manchesier race would certainly seem to prove that this important stage in the development of human flight has been

age in the development of number right has used ached and successfully passed In strong contrast to these achievements of the seropisne is the series of disasters to airabips, culmin ating in the wrecking of the huge dirigible "Zeppellu which have occurred during the last few w Although the dirigible has proved to be perfectly stable and to possess the ability to fight his way against ainds of considerable strength the late disasters and notably the wrecking of the "Zeppelin" emphasize

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the fact that, whenever these buge and delicate fabrics week or are in contact with the ground they are a imminent danger of destruction in this resi they are in the same class as the ocean steamship, whose captain cares little what winds may blow, when once he is well clear of the land with everywhere deep water below his keel, but whose anxieties in-crease in proportion as the water shoals, and the ves-

sel again spproaches the coast line

The perit of the dirigible lies in its buge bulk and The peril of the dirigible lies in its ouge outs and the great area which it exposes to the presare of the wind These elements, it is true, are not a source of so much danger when once the craft is well clear of the earth and has abundance of what the navi attor aculd call 'sea room in which to maneuver, but when it comes to the question of making a land ing, and so long as the airably is upon the surface of the ground is an unprotected position, as she must needs fromently be the dangers of disablement and even of complete disaster are ever present remember how the accumulated promure of the wind on the French airship "Patrie tore it toose from the siddlers who were frantically endeavoring to hold it down to earth and carried it over the English Chan-nel and scross Ireland to be lost in the ocean beyond nel and serous freind to be lost in the orean neword 80 too in this later disaster, the "Zeppelin," during an enforced landing, was caught in an increasing wind in which is was only a question of time before tha pressure proved too atrong for the cumpany of infantry that was endeavoring to hold the strahly

Of manner, in the place of the place wind pressure on large structures runs up to enormous figure. The designers of bridges make province of thirty pounds on mous figure. The designers of bridges make provi sion for a maximum pressure of thirty pounds on every square foot of surface. If we apply this unit of pressure to the Leppeltin' we find that on a plane of pressure to the Zoppetth' we had that on a plane warfare represented by the total length of 446 feet and the diameter of about 40 feet, plus the area of the cars, rudders etc, the pressure would amount to about 230 fons, and if we admit that the effective ressure due to the dirular shape of the gas bag would be only about one-half of this there would atili be a strain of 125 ions upon the guy ropes etc, by which the machine was held in position if we include the take Constance disasters, this is

the third or fourth wrecking of a Zappelin dirig by its being dashed to ideces in stormy weather after making a landing and the moral is that these ships of the air should remain as far as possible per manents affect tring up when they wish to make a stop, lo infty steel mooring lowers, which they must approach end id, and to which they must make fast by cables from the bow. This we believe, is the plan which Z-ppelin himself proposes to follow, and it would regiainly seem to be the only arrangement that offers security sgainst absolute shipwreck

THE DECLINE OF THE HUIVERSITY IN SCIENTIFIC RESEARCH

O many valuable discoveries and researchs are now due to scientific institutions under soverament control or founded and support ed by private munificence for specific purposes that the question arises is it not to such agentless rather than to the universities and colleges that we must took for the most active progress is future original scientific lavestigation?

Not only are these institutions for special research froed from the duty and cares of teaching but what is of greater importance, their organiza-Every possible assistance to rendered to the individual tigator, and he in turn is carefully selected f his proficiency and promise and with ample facility ties at his disposal and supplied with an adequa salary, he is expected to work systematically along certain definite lines with entire freedom from finan cial or administrative concern

At the head of these institutions there are usually directors who are men not only of eminence in their special science but competent to organize and con duct campaigus of scientific research, which may quet campangua in scientific research, which may include a number of workers often in widely different fields, yet all capaged in studies merging into one definite wheme Each worker receives full credit for his particular contribution, and the solution of great and romplex problems is undertaken with all the efficiency of organization and co-operation char asterists of the best and most modern industrial and commercial practice Yet there is no sacrifice of the true scientific spirit and the only elements of the commercial spirit and the only squantial of the commercial world that are applied are economy of effort and resource, efficiency of organization, and adequate capital and plant to push to a satisfactory optrome any particular project or class of Investigation

investigation
These conditions have attracted many investigators of reputation, and in such scientific establishments as the various laboratories of the Carnegia foatitution of Washington in Rocketeller Institute for Vedical Research and the research inhoratories of manufacturers' associations and large corporations.

not to mention those conduct auspices, much scientific works is done. One might refer to is done. One might refer to es, to national physical and bureaus of weights and mical observatories and biological mical observatories and biologisal seums and matorological observe every case there would be found ord of scientific activity. They may be a second of the contract and is often imports and in its application to the second menits

With this over increasing efficiency on the special research institutions, we see broader face with the fact that no longer are Assertitis col-leges and universities with their various addutifilayer and universities with their various substitutes to hook and ishoratories in a speed a publican to forward selectific research as of yeld. See five-cases there are speed and onlyments with a vigorical variety of the control of ciliacs where there introduction interference from coverning boards and substitute from the control of t lites for modern reserveb, nor is the appendixed as the act of make it is procuration; markles the make conditions of evoponile will leave the season of the work of the great American assessment; that its dipartiments cover at least in theory, and interest aby wide range of knowledge and as well as the forthelf support appropriations none of the mark must be granted by administrations and process the season without any exact and meetal known of the season of t hindgets of such an organization, with fined field the governors of a university, by the intricacy of the situation as well as the mag-nitude usually adopt a policy of averaging the sp-propriations to different departments rather than of suming the responsibility of passing on the

or urgenty of their work But important as are material support and facili-ties to modern research, this is by no means the only or most serious question for the main of gautins triumphs oventually over the difficulties due to their triumples overtually over the difficultier-due to their measure. So catcaded have American underweather revertly become, both in scope and nations do inside the intent toot invente toot invente and and in the desire for large registration that an executive head of the university demands from his executive near or the university demands reess are staff as a condition of usiary advance or promo-tion, the greatest possible amount of teaching, be it congenial or not Under such conditions it is not difficult to see that the lime and inclination for (Onsenia) or nol special investigation and research by a young scien occupying a university curtailed Furthermore, so intricate is modern uni-versity mechanism and even minor administration that from a professor there is required an ever-inversity mechanism and awah initior administrations that from a professor there is required an ever-tivessing amount of clerical labor in the composition of statistical and other records, and information about, sutdents and departmental information about, sutdents and departmental information about, sutdents and department of the composition which today is and to initiate commercial formation which today is and to initiate commercial formation which is a substantial information and initiate commercial formation and initiate commercial formation and initiate of the professor function and initiate of the professor function and initiate of the professor function and initiate comparison with their Ecoposan collections. This condition, university presidents and tractors in a comparison with their Ecoposan collections. This condition, university presidents and tractors in a comparison with their Ecoposan collections. This condition, university presidents and through the condition, university presidents and through the condition, university presidents and through the condition, university presidents and tractors for insulation and the condition of great and further endowments for insulation and collections are considered as a support of the condition of great and further under a condition of great and further under a condition of great and further endowments. when applied to special institutions apart free cational machinery. It must not be understoo the training of young men for the training of young men for scientific rise, by hea experienced any also kning of effort in our, versities and technical schools for it is these spread stimulated as never before by their proteomy, such will hear forward the torch of scientific progress, Education and original disovery seem destined in the the future to be cárried on by totally distinct ar-vanitations.

That the silver area in northern Ontario is confially being widened in originated by the discounty of antive metal about fifty miles west of Cochrant on the Grand Trunk Pacific. It is understood that the discovery was made in blasting out a railway out when the news reached Cookrane, sixty prospectors started out the next morning and this number is be-ing constantly augmented by fresh arrivals.

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AERORAUTICS.

Mr. A. L. Pfitaner has been making successful flights with his noval monoplane (which was illustrated in any insue of February 18th) of late in various places On April 15th he made three successful short flights at the April 18th he made three successful short nights at the Buffalo Country Citch, and in the fourth flight be rise across the field at a high rate of speed, rising to a height of ten or twelve feet, when a gust of wind struck the machine and drove it to the ground with great force. The aviator was braised and badly shaken such and his machine was more or less seriously dam-aged. Despite his accident, Mr Pfitzner has demon-strated that bis novel sliding wing tips work well

Missers. As Merring and W S Burgess have been expurimenting with the former's new biplane on Plan Himsel, opposite Newburyport, Mass. This new ma china, which was illustrated in our issue of March 1998, has demonstrated that it can elide over the nessed and rise from its single skid without the use 2 Wissels. On April 17th, Mr Herring made a short fight of about 250 yards. On the 21st he made three shibs flights, in the longest of which he covered about \$\sqrt{2}\sqrt{ y 8 Curtis, while flying the machine at an of height of thirty feet, lost control of it eded and struck the ground head on, a soft meadow. It was badly smashed. stely in a soft mead the aviator was not injured

Wills swistion advances by leaps and bounds, zero-statish has had several serious setbacks of into To begin with, on April 3rd the Germen bettoon "Pom-merts," celebrated for baving won the Bonnett cup mers, celebrated for baving won the Bennett cup race in America in 1908, fell into the Baitle Sea and three of its four occupants—one, Herr Deibrick, a member of the Reichstag—were drowned The next day, Front Abegg, a well-known German chemist, was killed while making a landing, while on the 18th ulti mo the balloon "Delitusch" carrying four men hurst during a thunder storm while at a height of several d feet, all its occupants being killed by th thousand feet, an its occupants owing street up the fall. It was at first supposed that the balloon was struck by lightning, but this was afterward found not to be the case Emperor William, however, has had a thorough investigation made and is getting together all the facts regarding the igniting of the gas in balloons by atmospheric electricity

As far as dirigible balloone are concerned, German which for some time past has been in the lead with this form of air craft, has also suffered severely 46 After making various cruises in the vicinity of Co-legas, the "Zeppelin II" "Gross II," and "Parseval I isgus, the "Zoppello II" "Gross II," and "Farseval I alraktigs few from that city to Hombner on April 21 and and were reviewed by Emperor William As a gasteng up, the stribble were morred at Homburg over algabt. As strong winds continued, the 'Gross II' which is a non-rigid diricible) was defacted and ahipped back by rail. The "Parseval" and "Zoppelin" lit attempted to make the return journey, but only the former was essensitud in accomplishing it. The "Zappelin" lost gas and was forced to descend at Lim barg, where it was moored again over night, and fully inflated in the morning. At noon a sudden squall of wind tore the bugs dirightle from its moorings and it floated off without a rew. A haif hour later it was driven to the ground at Weilburg It. fell beside a cliff and broke in two The andden demolishment of this, the principal airship of the German floet, bas shown how precarious is the existence of these leviathans of the air

On April 21st Prof John J Montgomery, of Santa Clara College, Santa Clara, Cal, lectured before the Aeronantical Society in New York upon his aeroplane Aeronantical Society in New York upon his seroplane experiments. These were beginn in 1853, and Prof Montgomery met with no little encreas from the start Arter fart trying a fapping-wing methion, he has held in a monoplane gitder having wings 10 by 4% feet in sake, and patterned farter the wings of a guil, e, with a dewnward curve in front. Upon running down hill with his first glider, he rows and giffed 600 yards. He with this first gitler, he rose and giffed 600 yards. He sessered and maintained equilibrium by leaning his body to one side or the other. He next endeavore the sessure better control, and to this end studied the birds closely. He was able to determine just how they warp their wings. Then he built ceveral machines with warpable vings resembling a first wing the studies of the session of the se evelved a Langley-type warpable glifler having curved surfaces and a fixed vertical tail (in conjunction with surfaces and a faced verticul tail (in conjunction with a inorwhis horizontal tail) that worked epinedidy, and that could be steered simply by warping the wings. This mackine, piloted by Daniel Maloney, what cut loose from a belloon at heights of 1,000 to 8,000 feet, and the avistor was able to glot a landing place and alight wherever he pleased. Prof Montgomery secured a U. S. patent (No. 321,172) on new bamber 18th, 1908, and in view of his practical demon struction of steering without the use of a vertical rand secured a U. S. patent (No. 881,173) on Sep. der, it would seem that this rudder is not as one

ELECTRICITY

The Subway Telephone Construction Company of Chicago has promised to provide that city with a complete eutomatic telephone system by the first of June next year At first it will cover only the business district, but leter will be extended to the residential sections.

Merchants in the South bave awakened to the valus of rural telephone lines, and are seeking to develop them, with a view to increasing their trade emong the rural population. In certain sections they have made large contributions to aid the farmers in building their lines.

The Westher Bureen has erranged to give daily weather forecasts by telephone to farmers in Texas At noon each day rural subscribers ere called up, and the weather forecast is ennour and the executer rorecast is ennounced to ell simultaneously. Subscribers in towns and cities can obtain the weather forecast at any time of the day after 11 A. M by calling up central

A writer in Physikalische Zeitschrift has been in-A writer in Physicalische Zeitschrift has been in-vestigating the frequency of electrical oscillations when a condenser is discharged through a spark gap He finds that this depends to a large exten-on the nature of the electrodes. For instance, a on the nature of the electrodes. For instance, as discharge between copper and silver electrodes would give a longer wave isngth than a spark between magnesium electrodes, and he comes to the conjuston their magnesium is the most suitable metal for enerk electrodes

A new system of jointing lead cables has been developed in England. It consists in placing a thin ribbon of pure tin between the surfaces that are lo joined, end then heating them with a blow lamp. The surfaces in the presence of the tin m lower temperature than normal, and thus they are soldered together. The tin ribbon is treated with a composition to prevent exidation during heating a composition to prevent oxidation during heating.

Another system of jointing coasists in the application of a mold over the cable. A piece of tin ribbon is applied to the surfaces which ree to be joined, and then moltes lead in poured into the mold. The flow is so directed as not to burn through the lead beething of the cal

The fourteen-year-old president of the Junior Wireless Glub of America appeared before the Stuato Committee on Commerce last week to protest against the bill introduced by Seastor Depew for regulating wireless telegraphy The young president gave a very fortible argument in favor of amoteur wireless very fortible argument in rayor of anioccur wireigns telegraph operators, pointing out the fact that if the bill were passed it would check the inventive grains of some forty thousand experimenters lie also called attention to the fact that it would be impo cained attention to the fact that it would be impos-able to enforce the bill without a verifable ermy of export wireless telegraph engineers. The junior wire-less telegraphere claim that it is possible to cut out interference if the proper apparatus is used, and that the present attack on amateur wireless telegraphers.

The Third Avenue Raliroad Company of New York tried out has winter a gasoline-sieviti cer or its crosstown lines. Now another type of cer is bing tried, and a comparison will be made of the two The new car is a reconstructed horse car product with Gould storage batteries and a pair of two horse-power motors. The battery is pinced under the reats of the car and has a rating of 420 ampere-hours at \$4 voits it is made up of twesty-nine plains per cell, and there are forty-four cells at each side of the car. The gauses that are generated by the balthe car The gases that are generated by the bat tery are carried off by a ventlinting system and ex ansat under the rear platform. The car weights only eix tons fully leaded. It has been found to consume in actual service only 054 wet hour per ton mile, while maintaining a speed of six miles per hour with nine stops per mile.

The steel hull of a vessel is rendered magnetic during construction by the hammering of the metal, and every etect vessel has to have its company cor-rected to counteract its own magnetic lines of force agnetic influence is further complicated by the load carried by the vessel if this load is marnetic or load carried by the vessel if this load is magnetic or capable of being magnetised. The ore-carrying ves-sels of the Great Lakes experience great difficulty on this account, and the United States Hydrographic Sureau is endeavoring to teach pilots and captains of vessels plying in this trade how to check their course by means of the pelorus. The pelorus is an ent similar to the sun diel, being p with a gnomon end a graduated are on which a shadow of the gnomon is east. The instrument is set in a north and south direction, as indicated by the compass, and then by noting the shadow on the graduated are, it is possible to tell by comparison with tables, furnished by the government, just how far from the north and south position the gnomen really lies, thus showing the compass error

SCIENCE.
Prof. Adams, of the Mount Wilson Observatory, has been making a spectroscopic study of Halley's comet He finds the head to be currounded by eyenogen gas end the tall be to composed of hydrocarteens

Sir Ernest Shackelton received a gold medal from given in his honor on April 22nd Among those who spoke in praise of Sir Ernest's achievements were such famous Arctic explorers as Rear Admiral George Molvillo and Amos S Bonsai

In an article published in Light Mr Robert E Liv gaton states that the first man to use gas in New York city was Mr Samuel Legget who lighted his house at No 7 Cherry Street with it The people kept at a respectful distance from the house, fearing an explosion Newport Rhode Island, end Baltimor

Rev. George M. Zwack, S. J., secretary of the Philtippine Weather Burau has prepared at the request of the insular spectace. The Land of Helley a Comet and Popular Apure benations' for diribution throughout the isleuds with the object of reassuring the natives, who, it is said, are aiready a prey to many wlid rumors on this subject

The American Philosophical Society of Philadelphia has decided to assist in the movement for an expedi-tion for south pole exploration. The project was urged in 1909, when the following scientific ascieties united in 1909, when the colorwing weight assured united in an appeal in Congress. The American Academy of Aris and Sciences American Georgiphical Society California Academy of Sciences, New York Academy of Sciences, Franklin Institute, Geographical Society of Philadelphia. American Museum of Natural Sciences, Geological Society of America Association of American Geographers and the American Alpine

In a le delivered before the Royal Society of Naples Prof A Piuti called attention to the discovery by Paimicri in 1881 of a characteristic line of ery by Faimitri in 1881 of a characteristic line of hellinn in the fame spectrum obtained by heating in a flame 'an amorphous, buttery substance of a yellow color which was found as a sublimate on the edge of a fumerolo near the mouth of Vesavina' This is generally accepted as the first discovery of terrestrial bellum, eithough Nasini and Andelini in 1806, on ex-emining the flame spectrum of a large number of vol cante increasistions fatled to recognize the presence of helium in any of the specimens they examined und the condition described by Paimjeri

The Express of London claims that another word must be added to the dictionary of gardening. This is 'Csioriculture' the name of an entirely new system of horticulture which has revenly been inaugur ated, end bids fair not only to replace the form of intensive culture of the French school, but to revolu the present system of fruit and vegetable force ing While it is nearly customary to look for extreme and favorable developments in the line of soil cuit vetion, through French means, to us in the United States, who have not the garden habit quite so atrobaly as obtains in France it comes as a surprise that the inventor of the new method is a Briton Dr F Alexander Barton, is liow of the Royal Society

For the last year systematic excavations have b made at Ostia, the ancient harbor of Rome at the mouth of the Tiber The ruins of a large city built mouth of the Tiber The ruins of a large city butti probably by Hedrian over the old republican town, have been uncovered. Archeologists consider the dis-coveries as important as those of Fompell. Heretofore It has been believed that Ostia was founded by Ancus the fourth King of Rome that it stroved by Marine during the chill were rebellt dur ing the republic sank into liesignificance, and was buried to the sand and deposited in the Tiber when Trajan built the new port and city of Portos of this it is now certain that Ostia not only continued to flourish under Hadrian but that the old level was raised six feet and that the republican town served as the foundation for a model city with rectangular wide streets, temples fora and squares

A case of extraordinary if not unprecedented hori al temperature gradient is reported on apparently golial temperature gradient is reported on appearance trustworthy sotherity in the Meteorologisch. Zeit-schrift for March 1910 With a temperature ranging between 0 dog and 4-2 deg C at II intentiors Finland on November 18th, 1909 a temperature of 20 deg to 24 deg C was simultaneously recorded at a point only 10 kilometers distant to the north, a difference of shout 20 deg C (68 deg F) in a distance of about 8 miles the climate at Heisingfors is tempered by the Guif of Finland so remerkable a difference between the temperature there and in the immediate hinteriand is inexplicable capecially as the two stations at which observations were made are of the same attitude The observations were made are of the agms altitude. The strangest part of the story, however remains to be told viz., that a little in the north of the place where the low temperature was reported the weather was almost as warm as in itselingfors!

THE NICE AVIATION MEE

WITH DETAILS OF THE CROSS-COUNTRY RACE FOR THE LONDON DAILY MAIL'S \$50,000 PRIZE

One of the principal aviating meetings which has been held abroad this year was that at Nice from April 15th to 25th Two of our illustrations show Purnum hiplanes that participated in this meeting. The one in light over the sea was pitted by During, an old time automobile rating driver, while the one an old line automobile rating driver, while the one which is shown on the bach was piloted by George thruz. Chaves on the 17th uttime accomplished several long flights above the sea. In one of these the gave out and the machine landed on the beach. as shown The meet opened under auspicious weather conditions and some spiendid flights

were made on the opening day A planes and a Bieriot monoplane were all in the air at the same time Effinof Chaves and Van den Born, all of whom flew Farman biplanes made some excellent flights. Rougler also The results of the first day's flights in the various contests were as follows

contests were as follows

Total Distance Prime — Edimof (Farman biplane).

130 718 kilometers (81 17 miles) Chaves (Farman biplane), 105 508 kilometers (85 28 miles). Van den Born (Farman biplane), 87 508 kilometers (84 14 miles) Meirot (Volain biplane), 15 kilometers (84 14 miles)

This competition was for the total distances flown in all flights made during the day by each competitor Harting Prise, Without Passenger,—Efficient

to Manchester, England, on the 27th and 28th ultimit for the prise of \$50,000 offered three years ago by the London Daily Mail. On April 23rd Mr. Claude Gra-London Daily Mail. On April Strd Mr. Chause of hame White, an Bagishman, attempted the flight his Farman biplane. After covering the 115 miles Litchfield in 3 hours and 6 minutes, he quit bettly with the violent wind and the cold. The next is with the violent wind and the cold The seat his acropiane was heldy damaged by the wind W in its (susperary shelter. It was taken apart shipped back to London for repairs. Meanwhile atter Louis Paulhan wisted London and entered row France on April 1810. The state of the State o

ately to Hampstead (5 miles London) and croming the st tine at 5 31 He had a will to his waist, and he will made brilliant flights, on one occasion

crossing the Var. and another time flying haif a ndie out to sea Metrot flew for haif an hour on his Voisin bipinne, and Olicalagers made sev ral short flights in his Hisriot mon plane which appeared to interest the spectators more than the biplanes on account of its bird like appearance The English entrants in this meet Mesers Rawlinson and Rolls, were unfortunate. The first named was unable to its more than half way around the track the first day on ac-

around in track the first day on ac-count of trouble with bis Darracq mator which he was using on his Henry Farman biplane white Mr Rolls did not receive his Wright biplane from England

his Wright biplane from England
The second day of the meet nearly all the aviators
made excellent flights. Herr Grades monoplane
failed to arrive and so be did not participals in the
slights. Riffmoff made a flight of 80% milles, and Vha
den libra in vol miles. Mr Rawlinson made a daring flight out to see a White turning above the water,
he was apprached too tooley by 25mmoff, the result
being that although the two aerophanes did not toughaccord other. Mr Rawlinson's full into the see, and was
except of the seed
Charen's wreshed Ferman mechine which dropped into the water when its feel gave out.
 Dump flying over
the breakers in his Farman biplease.
 A novel system organization fitted with a fines-definable Assessimation.

THE AVIATION MEET AT BIOS.

(Farman biplane), 80 meters (242 4 feet). Starting Prise, With Passenger —Efficient, with Prince Koudacheff (175% pounds), 100 moters (228

Prise for featest circuit of the course, \$400. Won by Edimof, who few \$ kllometers (3.73 miles) in 6 minutes 23 3/5 seconds—a rate of 85 miles an hour in this aviation meet over a dossa strators cou-

poted, and many other flights were passe.

The greatest sporting event that aviation has had thus far, as well as the chief demonstration of the practicability of the aeroplane for the rapid transportation of individuals, was the race from London

special train on the railway 1,000

Soon after Paulhan started, word was brought to White, who word was brought to white, was had completed the repairs to his machine and who was resting at the hotel Rushing in an automobile to his aeroplane, he started at 6 22 from Wormwood Scrubbs in pur-suit of Paulhan But the latter high from Wormwood Scrubbs in suit of Paulhan But the latter gained an hour's fiying time is darkness settled down, and alighted at Litchfield at 8:10

Assess setting 6.00%, And, Assessment of the control of the contro

Scientific American

MULIAR STRAL ARCH OF THE SERIES STOW ROOF

There is a type of dome that can be built without a scaffolding and that requires a man to be immured within the vault to issure proper construction. It is the invention and soil property of that most ingenious the investment and some property of their must ingentum of savage races, the Sekimo and contains several prin ofnice new to civilized architecture

objass new to divinised architecture.

There are four fundamental types of arch and dome, of which one is the Eskimo poculiarity. The simplest and least used, because least effective is of the simple shault of the control of the co issants type—Histrated by and to-day chiefly em ployed for, the house of cards. Next comes the false inverted-step arch where each block or brick projects inverted the one below and is held from toppling in by the weight of the material above and behind it This type of gateway and chamber was invented inde pendently by the architects of Agamemnon more than pendently by the architects of Agamembon more us 2,860 years ago in ancient Orecce and the precurso of the Astees in Mexico at nearly as early a perio This construction inharmity demands a vast amou making or fill in proportion to the vault of the

area it is reasine for a gate in a jong ea-an underground hall or drain but cannot stand alone and is a faire orth. A free por-tal, or a dome rising into the air cannot be tal, or a dome rising into the air cannot be built on this principle which is consequently but little employed to-day Our true arch tune being the use of wedge-shaped blocks tune being the use of wedge-shaped blocks. When the last and contral one of these piece—the key stone—the dropped into place the whole mass supports itself. The top cannot fall inward unless the supports are toppled outward. The primary thrust is therefore al ways not in but out and buttressing of son ways not in but out and buttressing of some sort is requisite. Another inherent defect of this arch though we are so accusiomed to it that we do not usually note the fact is that until the key stone is fitted into final position a temporary structure must be rected to hold up the parts already in place. The last type the Eskimo vault is a truo dome exerts no outward ihrust and requires no temporary

outward threat and requires no temperary scandiding it is also unique to that its ma terial is not brick or stone but sense. The construction is used for the bechive-shaped winter houses of these so-called savages and is upital in plan as shown by the disgrams. A row of blocks is first laid on the ground in a circle—or more creatity a polygon. Buch of these has a slightly sint top, and cay the tree of these three controls are the controls and the controls are t

raises its surface a little beyond the last until when the circle is completed the gap in height between the last and first blocks gives the thickness for the see man and true mocks gives the thickness for the following courses. In these the upper and lower sur faces of each block are parallal as in a brick but the gradual upward trend given by the first course is of necessity maintained.

In each successive round the snow bricks are les inward more by having their lower surfaces sliced of to a Bevel If set squarely end to end they would before long lean inward so far that they would tum ble For this reason the end of the block last laid is ble For this reason the end of the block hast taid is out at an angle. The next following block has the joining end slanted at the reverse angle Thus it fits in behind the preceding and is prevented by it fits in behind the preceding and from slipping inward. As the house

grows the circles become smaller until at last only an irregular polygonal opening is left. This is filled with a wedge-shaped block cut to shape It is however not a key stone as the remainder of the

tructure supports itself

The blocks of firm snow are usu
ally dressed outside and handed lacing to the man on the in The last block he holds np with one hand slices to shape with his ivory knife in the other, and his ivory mire in the closer, and drops into position. He is then entirely inclosed in the want. Only after the house itself is entirely completed does he cut out the low r, which to keep out the cold as much as possible is only big enough to crawl through A long low tunnel is then built in front of the deor, to break the force of the Arctic's loy blasts Even a window is present A small aper ture is cut out over the door and turs is cut out over the door and filled with a pane of clear this ice All that is emitted is the Size or chimney Whatever heat is pro-cued by the seal-oil langue is wanted inside, warmth being a mapes serious necessity in the cil major in the cil major the cil major their conWhether the type is practicable in other materials has been doubted. The unsurpassed lightness of snow is certainly a great advantage. In heavier materials ngth would, however, compensate for increased



Plan view of partly built but, showing how each bi



rtly built. The snow blocks are laid in a continuous spiral course



Section through Polices upon hon-THE PROULIAR SPIRAL ARCH OF THE ESKING SHOW HOUSE

for the inward slipping tendency that weightier ma tarials would show The greatest difficulty in working in ston The greatest difficulty in working in ston would be encountered in shaping the separate pieces of ma sonry Owing to the spiral and leaning construction no two blocks can be exactly alike in either shale of

ire and in every succeeding course catch block de parts more and more from the right angle in its pro-portions. To compute in advance exactly the print ranging for each piece so as to insure true bints would be a matter of much complex mathematical realculation

It might however be practicable once the cal da

It might however be practicable only the call its flone had been determined for a building of standard size to draw up a table of the angles and dimensions required for each successive block. If the size of the structure were reduced or increased from the stand

ard each stone would only require to be diminished or anlarged by a fixed ratio.

It would take our aliest engineers longer to pian such a dome than an hakimo would not to build a willage, but the remitting simplicity of construction due to the leavitableness and simplicity of the prox reas of crection without any temporary supports but treases or reinforcement might more than compen

The spirally ascending bevellocking Fakimo dos is the only true vauit any part or the whole of which will stand entirely by Itaelf

A GAMELINE MOTOR RETURN PARCEL MARRIED MARRIED BY WAITER LAN PURD

The details of construction and method of operation The details of construction and method of operation of a unique gasolin motor-driven earth boring ma-chine are shown in the accompanying illustration in device was recently designed in california by Charles I Belly and the photograph represents it in working position in actual operation at Sacram nic

It is stated that with one of these machines about 25 miles of holes were bored for use in fenc ing along the right-of way of the Western Pacific Rallicad between Maryaville and Oro ville (a) These holes were bored under ville (al These holes were bored unner particularly trying conditions as the ground was gumbo land with the exception of a short streich of nursub soil and so bard and so dry that every bit of it had to be broken with it k and crowber when dug by hand in addition to the hard ground had about 20 to 2" per cent small cobble yet this labor saving devi e bored through all of it and did the work of from twoive to fifteen

> Such a mathing is of great value for hor ing bols for less for numerous other uses for whith shallow hols are required and for the jurjos of lightening the labors of Experience above that the harder the ground and the more difficult it is to work the more amostly a machine of this class is desired

This entirely new unique and practical en gine driven apparetus is a most remarkable device in its simplifity and owing to the wife range of us a sea labor savir it slands on surpassed. It will be seen that it is ex

surpassed II will be seen that it is one to make surpassed in which and cutterly fractual and will be found a great a commit r of time and money where post holes are to be dug electric line. It is task but I kephus poles set or where treas and have an another treas and the passed by the service of surface are to be planted in books uniform in size at top and be from and of suitable diameter and depth.

It is held to be practical for use everywhere as by est the machine will work satisfs trylly in either dry I at the machine will work satisfa trily in either dry cl wet sell or in any place wher the machine an be driven as it beres readily through insignan and shale oft aradatons and small cobile and as it will bore at different angles and on either wide or back of the truck it will do equally good work whether on level

ar Redley (al a great number of holes or hord in very hard hardpan for large poles the

ma hin being particularly successful in this work be-cause the contrast between its effi-ciency and hand labor was so strongly marked At Mendota Cal a record was made by one of these machines on largo fen + work in hard dry earth 90 holes being bored "3 fe t apart and 30 inche deep in 60 couses the minut a the

holes I lng 8 in h s in diam ter For use in boring small holes a rikal engine of the double cylin r type is utilized that develops 7½ horse pow r In boring holes for large poles a machine of this type is fitted with an 18 lach auger effecting a depth of 64 feet power is supplied in this case by a double cylinder gas line engine of 12 horse-jower cats ity

Is norse-jower cat a lly

Fills device is said to be inex

p many to operat as a man and a

boy only are required for its efficient
working the boy to drive the team and the man to manage the ma chine its not earning capacity is said to be greater than that of a threshing machine costing fiv-tines as much its mason of us-fulness extends over the enti-year and in many instances in year and in many instances in hard ground has done th work of

It is maintained that in cold countries where other farm work



WHERE PRESENT OF SARYS-DUMING MARRIES ASAST TO ROSE A MOLE.

is impractical during the severe season, post holes can be dug and fonces built during the winter, as tith is well adapted to boring through its, frozen ground, hardenn, shale and the like

in the planting of orange trees peach trees, grape vines or in having a piece of land undertaid with hard pan in which holes for any purpose are expensive to dig this form of machine will do the work of making opening through any crust for the top root of

The unper frame and boring tower being on a ro intable platform, one can easily adjust the machina in a hole on either side or at the rear of the machine when the device is in a position to have a hole, all that it is necessary to do is to pull the feed clutch, and that it is necessary to do is to punt the reed clutch, and the auger drops to the ground and begins work, when the auger is londed, by releasing the feed clutch and pulling the hoist clutch in, the auger is hoisted clear of the ground, or to any other position that may be destred

It is of interest to note that besides boring in the kinds of soil before mentioned the machine will bore in dry clay, or in swamp land without any change of augres or idis no ground being too sticky for it to There is no necessity of stopping the machine to clean mud off the anger as the machine does that Hunte

if there is an occasion to hore a line of heles down the middle of a well traveled road it will do the work without difficulty. A small type of earth boring ma 4 fert and which is equipped with twe augere 8 and 12 inches in diameter, white a larger machine has been developed which will hole to a depth of 8 feet The latter is fitted with three augers 8, 12, and 16 inches in dismeter

inches in diameter
It is stated that no change of shaft or auger is required to make the depth indicated. The time required to more from one hole to another and bogin work in a fence line is from 15 to 25 seconds.

The freq liption of the unachine see well as in he food rack, drill shaff genering, and auger shaft are middle of cruelibe and muchin; y etcel so as to withstand a

sudden impact as when stopped by running against ricks, old posts and similar obstacles

rocks, old posts and sensing conductes.

Chain beiling is used of the slaudard sprocket type
and in case of a break can be easily replaced. It will
be seen that this machine in boring does not scope
the earth but cuts it with thisel bits, which are quickly detachable the entire set being changed in two

minutes if desired it is reported that this machine has bored many holes 30 in hes deep in hard ground in fifteen sec onds for each hale from the time the auger touches the ground, and it is hard ground indeed when the hole cannot be bored in a minute. It has force feed, and therefore all the attendant has to do is to pull the lever and the machine does the work

LAUSCH OF THE "FLORIDA."

On the morning of Thursday, May 12th, there will be launched at the Brooklyn Navy Yard the second of the two largest battleships yet built in the United States the 'Florida' The sister chip, the "Utah," which in December last took the water at Camden N I from the building slips of the New York Shiphuliding Company, weighed about eight theusand tons. The launching weight of the 'Florida' will be about nine thousand tons, which is, in itself a record for an event of this character. The keel of the "Fier ida' was inid on March 9th of last year, and the work of construction has been carried on uninterrupted; under the supervision of Naval Constructor William J Baxler with Naval Constructor William G Groe

beck immediately in charge fu view of the great importance of the ship, and the gratifying rapidity with which she has been built. preparations have been made to render the corof launching particularly brilliant. Among the guests or inducing particularly artilinant. Among the guestion on the inducing platferina will be President Taft, Secretary George Von 1. Meyer, Andstant Secretary Beekman Winthrop Albert W Glithrith Governor of Florida with bis staff, Admiral De wey, and Rear Admirals Nama Sperry 8 throught, Waltright, Potter and Lucize. As the battleship fieet is new present at the yard between six and seven thousand his jackels and the officers of the ships will assist in giving dignity to the event. In agreement with the cus tom of having our ships christened by a representative of the Siale or city after which they are named, the ceremony will be performed by Miss Elisabeth Flor-ing of Jacksonville Fia

The usual constructors and employes of the Brook lyn Navy Yard me to be congratulated on having, for 13n navy rare are to be congratuated on naving, for the second time demonstrated that they are capable of hullding the largest and most modern warships, not only with dispaic he but of the most thorough and durable workmanaidp, for it will be called to mind durable workmansling, for it will be cause to mini-that from these very ways here was launched on Sep-tember 29th 1804 the fagship "Connecticut," which, although a much smaller ship than the "Floridat" (less by about 6,000 tons, in fact) was unvertheless the

largest vessel of her time in the United States navy, and approximately as large as any vessel in the and approximately as large as any vessel in the navies of the world. It is a long step, however, from navies of the world. It is a long step, however, from a 5,000-lon "Connecticut" to a 12.83-lon "Britch, and the Brooklyn Navy Yard should receive full-circle for the fact, that while eighteen and a half monthy elapsed from the laying of the keel to the launching of the "Connecticut," It has taken all feurther months to do the same amount of work on the hig ship "The material has been built into the built at an average rate of about twenty-few come per working day of eight hours. If all goes well, the working day of eight hours. If all goes well, the The date of the machiner; he machiner; he machiner; he machiner; he machiner; he will be completed early next spring. The date of the completion of the machinery is som The date of the completion of the machinery is some-what uncertain, the recent reorganization of the nary yard having thrown the atenn engineering shops sumewhat out of their atride The greater length of the "Florida," which exceeds

The greater longth of the "Florida," which accords the "Connection" by over stay for teet, the greater learn of seven feet four and a half inches, and her the control of the seven feet four and a half inches, and her necessitated, of crures, a great enlargement and strongthening of the permanent and issueshing way, and severely tract the capacity of the building slip (fur front page illustration shows how the ram of the silp cutted caracteristy across one of the streets of the in spite of this fact, the stern of the vess

impact to the buikhead wall on the water front
Just here it is well to notice how, in order to se Just here it is well to notice now, in order to secure the desired speed of 29 75 knots, the lines of the ship have been fined out, as compared with former battle-ships. The entrance of the "Florida" appears to be as fine as that of our armored cruisers. At the samo, time in order to secure good lifting power forward, when the ahip is driving into head seas, above th water line the sections are flared out very rapidly, thus giving the ship a form which is not only husyant and seaworthy, but adds greatly to the appearance of

The "ways" consist of the permanent ways made un of the supporting piling, cross caps and longitudinal timbers and the lannthing ways, in which she im modiately rests, built to conform to the underwater form of the ship, which travel with her as sho moves down into the water The heavy longitudinal timbers, which form the sliding surfaces between the fixed and iannehing ways, are thoroughly lubricaled with a special preparation, consisting chiefly of talle lard oil and graphite. The contact auriaces are made sufficiently broad to bring down the maximum area sure on the ways to 23 tons on each square foot. The ship is released and started on her swift slide into the water by sawing through the "solo beame," which are the last members that connect the lannching ways with the permanent ways. The "Florida" will move very slowly at first but gather way rapidly, and her

very slowly at aret but gather way rapion, and ner highest velocity will be about twenty miles an hour With the launching of the "Florida," the United States navy will have affect the first complete division of chips of the dreadcought type consisting of the "Delaware," "North Dakota," "Utah," and "Florida." A study of the accompanying table shows that the OPTHS ' NORTH DARIETA INC. AND THE "PLONING." 1000

	" North Dakots"	Piorida,"
Learth Beans Branta, mean Bisplacement Coal supply Oil Boit surace There tarmor Rattiny armor Hundscatash prefection Twelve look gans Firm inch guas. Houd cataset	60x feet 9 inches. 16 feet 3% inches. 26 feet 11 inches 9 \$1,000 tons. \$1,000 tons. \$1,000 tons. \$1 inches 10 inches 10 inches. \$1 inches.	131 feet 6 turken, 181 feet 84 turken, 181 feet 846 turken, 181 feet 85 feet 6 turken, 181 feet 6 turken, 18

With two-thirds fell supply assumunition and stores
 With two-thirds fell supply stores and feel and fell supply s

"Fiorida" is an enlarged "North Dakota, having the same length between perpendiculars, and two or three feet greater length over all, three inches more beam; feet greater length over all, three inches more beauti-one foot seven inches more draft, and 1,355 tone greater displacement. She is designed to have three thousand more horse-power, but a quatter of a knot less speed. The armament in each case consists of ten 48-calibra 13-inch game monated in five turrels on the center line of the chip. The 13-inch pieces for the later skips in the case of the Wyonting? cleas will be more pow-erful, being dity calibrar in length with a correspond-ingly greater musile volved and energy. In the headsful, torped-repelling bettory, the "Parieta" has the control of the control of the control of the control of the 11 is calibrated to our the Control of the Control of the con-

It is claimed by our Navy Department that the Florida" and her sister are the best-protected warahire aftest special attention having been given in her design to guarding the vital parts of the ship against mortal injury and to the localising of the destructive morial injury and to the localising of the destructive affects of projectites and torpodoes. Against sinking by torpedo attack the "Florida" is unfaquarded by an elaborate sub-division of the hull and an unusually powerful pumping plant for ridding the ship of such water as may enter. Against gau fire she presents

probably a more complete systems of artiser projection. has any contemporareous warship. The math armore but, over eight feet wide, has an average thintness of eleven inches, above this is another eight-foot best averaging nine inches thick, while the five-inch broof-side battery on the main deck and the bases of the municipated care by previous United States ship, the frent wall of armore briefs [8] inches, with best of the guar case armore briefs [8] inches, with best of the guar case armore brief [8] inches, with best of the guar case armore brief [8] inches, with best of the guar case armore brief [8] inches, with best of the guar case armore brief [8] inches, with the control of th

abowed, a necessary protection Between each pair of blinch guns is a l-inch transverse, splinter bulkbead. The "Fiorida" will be driven by an equipment of Parsons turbines, working on four shafts. They are required by contract to develop 38,000 horse-power, which, it is estimated, will anable the ship to maintain an average speed of 20 75 knots on trial As a matter of fact, she is likely to do from three-quarters to a knot better than this. The "Florida" will store, an addition to 2 500 tons of coal, some 400 tons of oil fuel. addition to \$600 tons of ceal, some 400 tons of oil fugl. Our navil constructors have long recognized tha value of oil as an auxiliary fuel, and as far back as \$400, when the plans of the "North Dakota" and "Dalaguage" were drawn, previator was made for atorage of all, the ships of that class carrying 400 tons. The keel of the "Utah," built by contract with a

private yard, was laid on March 15th, and the keel of private yard, was laid on March 16th, and the keet of the "Florida" on March 7th The "Utah" was launched on December 23rd, 1809, at the 50 per cent stage of completion, and the "Florida" on May 13th will take the water with 58 per cent of the work completed, a om-parison which establishes once more the much des-tested claim of the Brooklyn Navy Yard that it can build as rapidly as the private varde

The Enbricating Value of Mineral Lubricants at Wish

The behavior of a mineral inbricant at very high temperatures is dependent upon its chemical and physical properties upon the nature of the atmos ere with which it is in contact—dry air carbon dioxide, or water rappr—and upon the pressure of this atmosphere Schreiber in a recent article de-scribes his investigations of the jubicating value of mineral hibricants of very high meiting points, in various conditions The diminution of the inbricating power at high temperatures is due to the evaporation of a portion of he lubricant and to the formation, by of a portion of the unricant and to the formation, by oxidation, of compounds of the nature of asphalt, i.e., compounds insoluble in benzine it is not due to polymerization, as is generally believed. This increases in asphaltic matters is not produced in the presence of water vapor alone, even at a pressure as high as 7% atmospheres, in this case the dimination of the lubricating power is due solely to the craporation of part of the lubricant. On the other hand, when the inbricant is in contact with a gas which can exert an oxidizing action, compressed air, for example, the for-mation of these insoluble compounds is the chief cause of deterioration. Schroiber deduces from these experinents laboratory methods of measuring the lubricating power at high temperatures, according to the class of machine in which the lubricant is to be used

The (arrent Supples

The current Supplement, No 1792, contains an un-The current Storzanszer, No. 1782, contains an unaul number of interesting litterated articles Mr Harold Holverof contributes a splendid paper full of particles suggestions and height ideas on the prisciples of vitrous enameling of east from for industrial purposes Mr Henry A Wilso Wood's excellent review of modern atterective methods in continued Rear Admiral R H & Steam critically considers the armoricals, and holists out what type of vessels is likely to be covieted from it in the future. The North African refine lying in Algeria and Tunis affords almost an unfined field for schedulegist conservation. Some recent limited field for schedulegist conservations are recently supported to the control of t discoveries in this country are described in an illu Glacoveries in this country are described in an illus-trated article by the Paris Correspondent of the SCENFIFE AMERICAN It is very difficult to recognize stars by atodying the star maps and then seeking the atars marked on the maps Mr F R Russell, in an article entitled "Where to Find the Stars," provides the necessary link between the star maps and the sky A table of seroplanes at Olympia is published, with some observations on the theories of flight. The food supply of the future is considered by H B Armsby

La Lumière Electrique publishes a series of article reviewing the effects of the great Paris flood in Janu reviewing the effects of the great Paris flood in January, 1910, upon the electric stations, telegraph, telephone, and electric light service of Paris and its suburbs. The St Denis establishment escaped fundation owing to its judicious arrangement of pumps and sinices and its elevation above the groun thued in operation without any interruption. Most of the other plants were less fortunats. Even the new underground wireless telegraph station at the Champ de Mars was submerged for several de its delicate apparatus was very seriously indus-

Correspondence.

WHY WATCH SPRINGS BREAK. To the Editor of the SCIENTIFIC ANDRE

It was with an amateur's interest that I read the accession in your pages as to "Why watch springs reak." As the question apparently still remains unsettled. I feel tempted to contribute some additional views on the subject.

Formerly clock springs were finish giving the convolutions considerable frictional gric giving the convolutions considerable frictional grip upon each other For this reason, when running down, there was a very audible shuffling sound within the clock svery faw minutes, indicating the propelling force was spasmodic. Not only so, but the ticking sound of the escapement decreased in londness as the was prolonged from the last loosening of the To regulate this it occurred to me to apply a more unctuous lubricant to the spring to prevent the said friction. The result of so doing was a gratifying uniformity of tick-but only for a few hours-until

e spring broke
After the third experience of this kind I cea regard it as a mere coincidence, and thereafter applied so oil if there was sufficient to prevent rusting already on the steel

The nucciling of a watch spring and of the kind of clock spring that has just been described differs in that the watch spring unwinds from the outside of the coil, while the clock spring arbor backs up and un-winds from the center of the coil For this reason winds from the center of the coil For this reason the latter is not subjected to a breaking from contrac-tion due to coid, as there is always some room for the contraction to take place—excepting a possible mo-asymtary period just after winding. The same is not

sentary period just after winding. The same is not the case with a waich spring. If over-tubrication is destructure of stool in a clock spring, by readering all the convolu-tions continually active and under unremitting strate, the same would also apply to a watch spring Watch springs being smaller than those intended for clocks are naturally proportionally stronger and may conduc-te strain longer, but that it is detrimental in proba-ble. But oil on a watch spring is absolutely necessary solety to provide for this thermostatic movement which can only take place back and forth, to and from a can only take place back and forth, to and from a fard point—the arbor Yet the wearying strain on a spring due to over-tubrication can only be a centribu-tory cause to the prevalent breaking of this part. Extory cause to the prevalent breaking of this part. Ex-perience goes to show that the most frequent time for breakage is from an hour to three hours after wind-ing, and that the most frequent position of fracture in just outside of the annealed tip attached to the

Thus the owner takes his watch from his pocket where its temperature was, say 80 deg, and winds it until it brings up hard. The coll is then central and solld upon its arbor, which is held fast by a pawl

in a little while the wearer of the yest containing in a sittle while the wearer of the vect containing, the watch removes it, hanging it on the back of a chair while he retires for the night. The temperature of the watch pradualty falls to asy 60 deg. If as contraction been provided for? The morning will discuss. If the coil has not been wound too tightly on, if some time has elapsed before cooling to enable it. draw on what has been paid ont, or even if th rate of cooling and consequent contraction has not ded the rate of release due to the movement of the works, the spring may escape But what approplied the writer is not the breakages but the length of

ice many springs attain

When one considers that the greatest movement of contraction is on the ontside of the coil, because of its contraction is on the ontside of the coil, because of its greater area, that the coil has just been rendered tant and rigid by winding, and that then a powerful con-tracting force is added thereto, principally on the out-side of the circle where the leverage is greatest, it

since of the circum what an uncondurate strains is not difficult to resilies what an uncondurable strain takes place close to the fulcrum, the arbor, for the spring is then but a solid lever

The fracture of a spring in many places is also not hard to understand, if we imagine a spring stretched to its elastic limit by contraction from cold with no slack to draw upon, each turn of the spring, from the outside inward, at an ever-increasing tension. An the outside inward, at an ever-increasing tension. An inner turn enaps, instantly contracts, and by that pronner turn anapa, narazury contract, and ny tian trees forces increases the spreading or expanding trees of temper. The change is attagether too rapid to permit of any uncolling movement, and the force thus added to the adjapent surrounding strand fractures that, gathering force with each smooseding fracture until, like a "Prince Rupert's drop," the pont-up strain comes

the a "Prince Ruperts drop," the peni-sp strain comes to rest with explosive suddenness.

That the pieces display magnetism does not necessarily indicate that it was produced from external influence, but rather that it was evolved by excessive strain and retained by the steel by virtue of its hard-ness, as is similarly evidenced by many machinists

tools subjected to severe service.

Regarding the preference of springs to break in the

summer months, is it not sufficiently evident from the following three causes?

1 The more constant and wearving strain due to

the better inbricating effect of warm oil.

The increased solidity of the coil when would
up, due to a thiuner film of oil between the convolu

p, due to a thiuner film of oil between the convolu-lons, also due to warmth

3. The looser texture and greater proportional brinkage of a warm spring compared with a cool one.

As to the remedy for this uncertainty of time-keepwould seem sufficient to provide for the ion tudinal expansion and contraction of the springs, and the simplest way would be to make them of metal in the simplest way would be to make them of motal insensitive to these changes. Such an alloy has been described in Scientific Americans Southamer, which he calls "inver" and in composed of steel with an admixture of \$1 per continuous and a composed of steel with an admixture of \$1 per continuous and graduated eaches for instruments. The fact that it does not rest should complete its adaptability to this purposes, as then it could be used without labricant and thus, except for a short portion at one time, be relieved of continuous and active strain

relieved of continuous and active strain Just how the nickel component will affect its per-manency of temper remains to be proven, but even if it retains sufficient recoiling force for its purpose for five years only, it would at least give warning of its waning strength and not leave its owner in th

which is perhaps all the improvement needed Another possible remedy which modern practice would indicate as quite feasible would be to carbonize would indicate as quite reasine would be to exponues the rods or plates, from which the springs are drawn, from one side only. The result would be, when chilled, a hard side (for the inner side) and a soft or elsa-tically tough side (for the outer side) with a general benefit of greater suring power with improved tensile strength

Watchmakors will tell you that the breaking of main springs saves many good watches from having their pivots out off, from shear wear, and the views of the facturer need not be consuited but the ordin citizen would prefer to have the spring as reliable as the rest of the watch James E France. St. John N B

INTERESTING MAGIC BOUGARD.

To the Editor of the Scipturic America in the December 11th issue of the Scipturic America cav (page 436) Mr. A Gaipin gives an interesting construction of magic squares, containing all the old

42	84		18			66	58	30
10	44	8	10	11		74	68	80
	84	81		#1	18	0	ĸ	70
73	80	47	-	74	25	16	1	100
			80					
12	3	F	8		88			
25	14		P		83			30
88	*	16	8	81	64	8	80	40

ers in the inscribed diagonal square numbers in the inscribed diagonal square. But this construction is applicable not only, as for Galpin says, when the basis is a prime number, but more syner silly when the basis is an odd number (1, 3, 5, 7, 8, 11,). The proof is very easy there is here the square of 9, as a cample of the simplest odd number not prime the general proof is an interesting exercise of algebra. on, Italy

STOROGRE IN A HOT-WATER STREET

To the Editor of the Scientific American
A short time ago I noticed a phenomenon which I
believe will be of interest to many of the readers of

the Stipatific American

The main building of our experiment station here is heated with hot water—It has been one of my duties heated with hot water It has been one of my duties to see that the system is working properly, and in this connection I have had to open the air vents on the radiators frequently I was surprised to find that the radiators on the top floor (a two-story building) al-ways seemed to have air in them, in spite of the fact that the system was fully charged and very little or no new water admitted I began to suspect that this condition had to be accounted for in some other way condition had to be accounted for in some other way was there not a possibility that this gas could be hydrogen. For what other gas would be likely to form under those conditions, unless it be a trace of carbon monoxide? At any rate, when I applied a match the gas lighted with the familiar pop of hydrogen and burned with its characteristic almost colories fame. Assuming that the gas is hydrogen (I have no means of testing it) the question suggests itself—is this a case of exidation of the iron setting free hydrogen? In it an electrolytic effect, caused by galvanic couples of

sither carbon and iron or iron and the brass comago-tions in the system? Or is the gas methane? It may be noted further that the gas does not seem to collect in the radiators in the lower floor to a great extent if any Of course, this may be due to the gas higher dissolved under the increased static pressu-static pressure on the radiators of the top ficover ten feet of water at the present time The water of axceptional purity, being supplied by a spring The fact however that small quantities of water have to be added occasionally to replace the leaks in the estion can only be settled by chemical analysis
Puyaling, Wash
C WESTERGER

AW RABLY APPRARANCE OF THOSE'S COMET

To the Editor of the fiverprine Awardana
The change with the fiverprine of the popular in refer
to comests is worthy of notice. Seventy years
ago when Encke's comer imade its appearance a great
ago when Encke's comer imade its appearance a great
deal of fear was arounded it was a young boy, but
remember very we'll the alarm of the people it was
indeed very strange and portentions, for it switched
about from the sentith to the horison, and was very
trillant I go color varied from a light to a fory red, strillaring and its longth was such that it stretched from the soulth to the horizon it hovered so long and was so conspicuous that all classes, young and old, were greatly impressed. About that time the Millerite cx citement prevailed, and there were many who looked upon the cemel as a sure sign that the world was surely coming to an end. There have been other comets which impressed the people but this exceeded all others in the impression made. Salem. Mass

Strengt D Part

A New Sense Organ of Butterdies

Every butterfly collector has had the unpleasant ex-perience that some butterflies, and particularly those of the species of Catocala (mourning clock) will no-lice bis approach from a distance and fly away in time. This observation ted Tebus to think that these nimals must have an nuditory organ which warns them of approaching danger by recriving sounds, and arcordingly he expressed the supposition that two pit-like depressions at the first posterier segment of the ody might be organs of hearing A therough investibody might be organs of hearing. A therough investigation of this ergan, heaver, has been made but recently by Prof. Dr. Deegener, the results being published in Zoologische Jahrhücher, Ahtellung für Anstonilo, vol. 27, Ne. 4. 1969

it is rather surprising that with a group so fre-quently collected (although indeed investigated, as a rule only as to their position within a system) as the Noctuids, an organ cenid escape observation which is nd quite generally in this group and which is by no means inkroscopic, but can be observed without difficulty with the naked eye as a siriking farmation on each side of the first abdominal segment. This location probably expialts why this organ should have because in by many persons without arousing the sus-picion that it could be a sense organ, for naturally enough such organs are looked for chiefly at the head, particularly at the feelire, sithough ether parts of the body may be the seal of specific sume organs, for instance, grasshoppers have their organs of hear-ing at the base of the abdomen, that is at the same on where the corresponding organ of the Nortuids

When examining the animal we see on cach side at the line separating the chest from the abdor and near the points where the rear wings are attached, a deep channel which toward the surface is surrounded by several humps. The external morph fached, a deep channel which toward the autrace is aurrounded by several humps. The external morph ology of this organ varies in details with the different period of the organ varies of the control of the organization of the autrace is a scarce by visible from the outside being convexied by long hairs at close foughter. The mirroundy cannot be the organization of a series of sections shows this only one of the control of the organization of t sensitory hairs and thus gives the organ the character of a sense organ. Telens's supposition, mentioned above, that this is an auditory organ may very woll be maintained since the structure of the organ an above, that this is an auditory organ may very woll be maintained since the structure of the organ an awers all the requirements of an organ of hearing Billit experimental confirmation of this hypothesis with have to be awaited Dr Deegens promises a further report, dealing with this phase of the subject.—Pro-

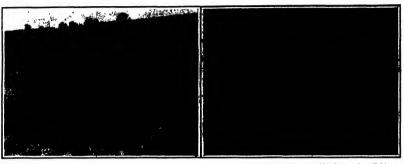
Approximately 3.748 miles of new main track were built in the United States during the year 1909 as compared with 3,214 miles for 1908. The 1908 record the smallest since 1897, when 2,109 miles were These figures do not include new second tided or fourth track sidings or electric lines. The net is crease during the year is about 1614 per cent, and 28 per cent less mileage was huilt than in 1907

REINFORCED CONCRETE WATER WORKS CONSTRUCTION

BY FRANK C. PERKINS

The accompanying views of the indianapolis water works show an interesting application of reinforced concrete to this class of construction. A gravity flow supplies the reinforced concrete filter plant from the Indiana State Central Canal which was constructed originally by the State for transportation purposes, but was taken over for water works service. At a disA reinforced concrete pipe line which is 840 feet in length, and has a diameter of 64 inches, and a shall 6 inches thick, conducts the raw water to the precipi tation busin. The pipe is laid 11 feet below the hy-featile gradient. It is reinforced with 4-inch twisted bars apaced 8 inches on centers, the shall of the pipe being built in three operations.

are 8 inches in width and 18 inches deep. They are carried on 18-inch 1-beams, inceased in concerts and bolled to the outpurs. The reinforced partition walls, 1 foot thick, are 350 feet in length. They are rein-forced in both directions, and measure 14 to 17 feet in height. The entire siah covers 70,000 square feet in each double filter 1 it is built monolithic, without



View showing construction of the ground-arch floor, with the reinforcement

Operating floor of the chemical house in which the water is purified in lime and from meturating tanks.

tance of about it miles above the intake to the filt is are licated the head gates and concrete sluice ways of this causi which is carried over Falls Creek near the filter plant in an open squeduct at an elevation of about 18 feet above the creek

The chemical house columns, floors and walls as well as stairways and roof are of reinforced concrete throughout. The lower part of the building contains the ilms saturating tanks over which are constructed the iron solution tanks all of which are of concrete Thoy are used in connection with the coagulating ns in the treatment of the raw water during

seasons of excessive turbidity

The following account of these works is based neon
data furnished by the constructing engineer, William
Curtis Mabes The water, which is drawn from the
Raw River is clarified by congulation in precipitation Raw River is ciarlful by congulation in preclytiation basits, which are provided with battle walls spaced 70 feet apart, and which are reinforced for the prevention of crarks. A line shall of coprete, reinforced with visited roots spaced 4 feet apart in each direction is used for lining the sloping embaniments of carts white the shall foor, taid in block as Net square, is 4

The water is measured in a Venturi meter, 42 Inches in diameter which has a throat diameter of 21 luches. The meter is built in the raw water couldn't the indi esting apparatus being located in the laboratory

In the construction of the conduit a coucrete cra in the construction of the conduit a concrete eracle io inches wide was first laid to grade in this were imbedded the lower rods, which were heated and bent in the field to the required shape, and left long conough to project a foot into the upper ring. On the cradle were then placed the semi-vircular metal forms, which ere fastened down by staked timbers. The mixture ut, in the proportion of 4 of gravel, 2 of sand, and 1 of coment, was poured into the space forming the lower half of the pipe. The upper half was then constructed by inverting the metal forms. The cost

constructed by inverting the metal forms. The cost of the pipe, which contained about 300 cmble pards of concrete, was \$11.46 per cmble pard of concrete, was \$11.46 per cmble pard of the pure water reservoir, with a capacity of \$1/20 million galloins, was built near Fails Creek, on a gravel toundation, at ordinary ground water level. The earth filling in 2 feet deep on the cover, the weight of the structure lizeff or relatancing any upward pressure that may occur The groined arch bottom was delared to resid the upward threat of a generous hearth of the control of the co sized to resist the upward thrust of high ground water at such times as the reservoir is empty, the inverted groined arch construction distributing the iold uniformly over the bottom. The reinforcement of the bottom roundsts of 15 inch twisted bars, spaced to luckes on century in each direction. The filter cover roundsts of reinforced 3 inch sides, supported by concrete beauss, a tritle lies than 30 feet

supported by concrete beams, a trifle less than 20 feet long, and spaced nearly 7 feet on centers. The beams

any attempt to provide expansion joints. A cable traus-way with a span of 450 feet was used in the construc-tion. A stationary engine and cable was used for protion A maxionary engine and only was used for pro-polling a shuttle car on a narrow-gape track, over which the concrete was handled from the mixer to the cablaway, 80 cubic yards per day being used in cover-ing 5,000 square feet of surface. The cost of the filter covers was \$14.65 per cubic yard, and the cost of the walls \$12.06

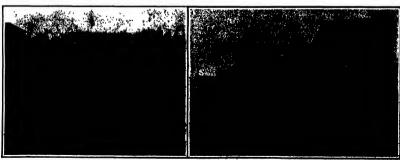
walls \$12.06

The reinforced concrete aqueduct, 300 feet in length, contains 4,500 cubic yards of concrete, which cost \$85 aper cubic yard instuding the comment, steel, sand and gravel, as well as the lumbor, forms, labor, and concrete labor. It is 41 feet wide and hase four spans of 60 feet each with a 10-foot riso from the synthight gills and a crown thickness of 18 inches for each of the four segm ental arches

each of the four segmental arches.

The foundations for the plors, wing walls and abutments were carried down 18 feet below low water, and
rest upon a bed of sand and graval. The aqueduct
takes the place of a wood aqueduct, which was supported by steel trusses on masonry plers, all of which were carried away by a flood which undermined the middle plor, the superstructure breaking up as the substructure crumbled away

With regard to the use of concrete for works of this character, Mr Mabos, the constructing engineer of these water works, makes the following comments:



Birel reinforcement of the 66-inch on

The emissi execute plant for pulping the execute.

Scientific American

Change has many advantages ever other types of solidericities. It is quelty and conveniently handled and trimsported, other set a best cost than stone meenry, and other subtable stand and gravel for the work in hand can be found on the site. With proper supervision, skilled labor is not essential in the small work, moreover, the art of mixing and handling concrete has been so perfected that machines do most of the work. Concrete has the additional advantage of the standard control of the work. tage over stone that it may be moided into intri-

cate shapes.

To produce onerest surfaces of a satisfactory smoothness and uniformity, it is necessary that the moids be carefully and properly built, and also that the concrete be of the proper consistency to flow adily into the prepared moids. It is also neces-sary to thoroughly churn and keep it in motion in the moids until the air has been removed and every the molds until the air has been removed and every crevice filled with mortar Properly handled in this manner, it will not be neccounty to brush or plaster the work after the removal of the forms. Con-crete may be placed in moderately freezing weathmountarity revening weather, provided proper precat-tions are taken to warm the gravel or stone and shad, to heat the water and to cover the work until initial set takes

Shane. The problem of preventing unity cracks forming in concrete is one that has worried many engineers.

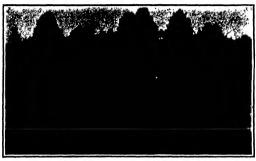
Plain concrete is liable to crack where you least on procition of these cracks by building abort sections in alternate blocks. However, by the juddelous introduction steal bars, objectionable contraction cracks can be equirity reiminated. entirely silminated

entirely eliminates.

The water works ongineer or superintendent is par-ticularly interested in the subject of waterproofing concrete it has been shown that wet concrete in more dense and consequently more impervious than more dense and consequently more impervious than dry concrets and that concrete becomes more or less portus as the quantity of cement is increased or ill minished A smoothly troweds surface produces a water-light sim or skin. It has also been found that staked lime added to its concrete mixture helps to make it less permeable. The lime does not injure the coment in any way, although relarding the setting Coal tar, pitch and asphalt mixtures applied on concrete are used with more or less success. A wash composed of one pound of itys, few peends of alumn and two gallons of water, applied with a brush and well rubbed in, has been used successfully on government fortifications.

ment fortifications.

A rich cement mortar plastered over concrete makes
a very good waterproofing medium. Proper situation
to these details will produce a water-tight structure,
if there is not likely to be contraction cracks, but in
works of any magnitude these are bound to occur
and they can be best provided against by the intrduction of steel bars. A rich concrete properly rein



wing the ground floor, the reinferced slab roof, and the Covered reservoir under construction, al

forced, conted with plaster and troweled smooth makes an ideal waterproof structure

The Baylight Edictory of Artificial Illuminants. In a recent publication of the Bureau of Standards, Mr H B. I've suggests that there is need of some method of cetimating the resemblance of artificial illusionants to daylight, that is, of elevermining their daylight efficiency. Assuming that, by the extraction certain qualities of light in an illuminant its color could be brought to resemble that of daylight very closely, the daylight efficiency of a source might be expressed in the form (intensity of available white injustification of the composition of the compositio In a recent publication of the Bureau of Standards, which, as explained above, could be used to bring the color of an illuminant into near agreement with day-light, though reducing its intensity in doing so Mr Ives presents some spectrophotometric curves of vari one sources of light, and a diagram tilustrating the amount and nature of light from the various sources amount and nature of light from the various sources which must be absorbed to produce white light He also tabulates the "daylight effectors," of a number of artificial illuminants. The method, however, is of of artificial illuminants. The method, however, is of practical rather than of scientific interest since it depends upon the particular wave-length for which the intensity is assumed to be unity, whon plotting the spectrum curves. In addition, "selective" sources such as the mercury are lamp ctive" sources such

which yields a spectrum consisting of isolated bright itnes, would work out to zero effickney ac cording to the above method Yet if we judge hy sensation such sources contain a certain amount of white light Mr Ives then proceeds to discuss the fact that any color can of white light and one ray of white light and one ray of the spectrum. The ratio of the white light used in attaining such a match to the in naity of the source studied is then the source studied is then regarded as an alternative method of defining white light efficiency which Mr Ives in this case ierms "white sensation efficiency". He points out that classification on this metid gives rise to materially different results from those strived at by the former method. The ef

ficiency in the case of the second method appears to be higher Yet the result gives no indication of the higher Yet the result gives no indication of the ability of the source to reveal colors of surrounding objects, and merely indicates the color of a white an face illuminated by the source in conclusion, Mr Ives remarks that the first method is preferable from the practical standpoint, and the latter from the purely

It is estimated that the Gold Coast and Ashanti could supply 60 843 logs of malogany and cedar per year if the internal communication were better With mechanical basinge, such as traction engines and light tramways, the output could be increased to some 250 000 logs per annum without depleting the natural



ral possibilities of reiniscool concrete are shown in this graceful, arched aqued

THE HEAVENS IN MAY

BY HENRY NORRIS RUSSELL

to solders that so much of interest to the amateur astronomer happens in a single month as in the one which is

nat before us

First and foremost, of course, is the return of lialley's comet to the post tion where it is seen to the best advanting Early in the month it is favor ably placed for observation before day break, on the 18th it passes directly

between us and the sun, and later it appears to evgreater advantage in the evening sky

At the beginning of May the comet is about 74 millton rolles away, but it approaches us rapidly, its disdiminishing to 41 million miles on the 10th, 27 million on the 14th As It was about at the limit of visibility to the naked eye on April 12th, while still 135 million miles from us, it is now a fairly conspicu

The planet Venus is fortunately near by and serves

as an excellent "pointer" as the comet. Anyone, however little familiar with the heavens, can easily find the latter by observing the following di

rections. Choose a window from Choose a window from which the eastern sky is lisible clear down to the horizon Rise about 3:15 A M and look due east. The very bright starlike object, low down in the aky, is Venus The comet is to the left of this and a little higher up at a distance about as great as the length of the bowl of the Great Dipper It will probably be rather fainter than the four slars, forming a great square, which lle above and lo the left of Venus, about twice as far away as the comet. These directions hold

These directions hold good from May 1st to May 12th On the 14th the comet will be on a levol with Vanus, and a little farther to the loft On the 16th it will be much lower than the planet and about 20 deg to the left. After this lie comet, or at st its head, can hardly be seen clear of the morn-

It will be very interesting to watch the comes grow larger and brighter night by night as il comes nearer to us How long its tail will be it is impos-sible to predict. The best time to see this bowever, will in any case be from the 7th onward, when the

the fth onward, when the moon is not of the way and the sky dark. The camest will be larger and brighter, too, at this time than previously. Even after the bead gets too near the ann to be seen, the tall may be observable in the mornings of the 17th and 18th extending upward and to the right. From the custy-the-rhoring, perhaps broad and shaded, from the effects of perspective since the end of the will be more house or the total the state of t of it will be much nearer us than the head

of it will be much nearer us than the head On the seeming of the 18th or morning of the 19th (according to the observer's longitude) his comet passes between us and the sun, and the earth will be caveloped in its tail if the latter is long enough

(over 15 million miles)

If this evening is clear it will be of great inter If this evening is clear it will be of great interest and importance to look for illumination of the sky in the early evening, just after sumset, the consist at will be in the cast, but a few home later it will have passed over toward the west. If, as is successful to the sum of the sky in general is comparatively brightly illuminated separated by an interval while we are in the deflace center of the skill because of the state of the sky in general to the sky in the sk tall Meanwhile, observers on the opposite side of our planet will have the rare privilege of seeing the sun through the comet's head. Only the extreme western portion of the United States is included in this favored region, but as the comet suters upon the sun's disk at 6 22 P M by Pacific standard time and remains on it till 7.22, the transit will be visible all along the coast. The comet passes almost squarely across the center of the sun from west to east.

action the center of the sun from west to east. Paradorical as it may seen. It is probable that the ordinary observer, even with a small telescope and dark glasses, will not be able to detect even the alighiest trace of the comet's passage. With powerful instruments the nucleus, if sold, might be seen as a dark spot a against the sun, if it is over 10 miles in diameter, but it is improbable that it is anything like so large, for, as has already been sated in these counts, when remote from the sun, is no more than a single mass of 0 miles across would send us. a single mass of 0 miles across would send us. Company to the contract of the section of the spectroscope, and as we will be looking through the tail lengthwise,

the sun on the 2th and of the moon on the 23rd. The former is an important collipse, the maximum duration of the total phase being over four minutes, but untertwastesty the trent of the shadow lies almost entirely in the Southern Ocean, only crossing the ootthern half of Tamessin, so that few sations are available for observers. As a partial cellipse its visita throughout dustrials, New Guines, and the solidboring islands

ble throughout American, ever
being lainade.

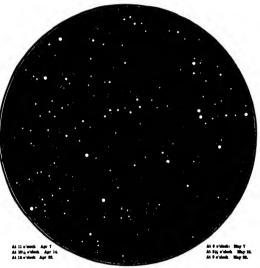
The inner eclipse of the Erd is of more interest
to us, being visible throughout the United States, orcopting Alaska. The moon enters the earth peaumnat it 31 sections retained within, and sire touches
the disappears in it completely, and does not entering
the disappears in it completely, and does not entering
that the model so the colipse, however,
her southern edge is only about 200 miles inside the
shadow, so that it will be considerably illuminately
sunlight refracted through our stamosphere. At 2 Et
A. M. the moon takes leave of the shadow suited
bra. This eclipse will be

bra. This eclipse will be

bra. This ectipse will be of importance to observers on the Pacific coast, as it will give them a chance to photograph Halley's comet on a dark sky The comet will have set for us in the cast before todility

THE HEAVENS With so much else to an gage our attention, our glance at the stars must nent constellations in the est are Gemini and Cante Minor, in the northwest, Auriga, due north, Cassiopela below the Pole, Ursa Minor and Draco above, and the Great Bear almost and the Great Bear almost overhead. In the north-east Lyra is prominent, and in the east Hercules, Corona, and Bollies. Scor-pio is rising in the southeast Due south is Virgo As our initial above, there is not the alightest resem blance in the stars to the figure for which they were

We may note the bright star Spica, a spectrosco-ple binary at a great dis-tance from us, and the double star γ (now close to Jupiter) which is now separable with a small telescope, but in 1835, could hardly be seen double with the largest instruments then existing The two components were then at the closest point of the very eccentric orbit, in which they revolve about one another in some 180



At \$14 e'clock Auril 88. RIGHT SKY: APRIL AND MAY

nearly 15 million miles of it will be there to exert effect on the sun's light. Even so, it will not be surprising to many astronomers if nothing un-

Buch negative results will however be scientifically valuable, since they will enable us to say that the materials composing the comet do not exceed certain limits of mass or density

certain iming or mass or density

Transits of comets across the run are very rara.
The most remarkable previous instance is that of the
great comet of 1882, which, though so bright-that it
could be seen close to the aun in broad daylight with
the naked sye, vanished completely when in frest of
the sun's disk, showing that it was practically per-

On the evening of the 19th we may perhaps aire On the evening of the 19th we may perhaps airseady see the conset: sail in the swening sky, though its head will set while the twillight is still very strong. On the 30th, however, it will be wished it! about 9 P M. on the 19th however, it will be wished afterward wall ster 11 P M.

On the 31st the councils bead will be close to the silar y deminerary in the 32rd about 10 deg above procyon, and on the 38th near and C Hydrac Puller Procyon, and on the 38th near and C Hydrac Puller

stalls will be given later

This month is also notable for two total colliness of

years. THE PLANTS

Mercury is evening airs until the 25th, when he passes through inferior conjunction, between us and the sun, and becomes a merning star. He can be best seen at the beginning of the menth, when he sets more than 1½, hours later than the sun. At this time he is in Thurus between Adeburan and the Priedmes, and

in Taurus between Aldebaran and the Piciades, and should be easy to see.

Venue is merting star, risting a little after 3 A M and exceedingly completeous all through the much Mars is eventing star in Genini, setting above-1-1-10. H. in the endided of the mention, at which time he is quite close to the star of Geninion, but is visible more than the star of the sight, remaining in sight till nearly 4 A M, on the tat, and till a little before 2 A M, on the Sixt. Settors is morning star in Aries, risting abput an hore earlier than the san in the middle of the month and two hours at its end; but it is too lave to he conspicuous.

Uranus is in Sagittarina, and somes to the meridian at 4 A.M on the 19th. Noptune is in Samint, on servable most of the night. On the 19th he in conjunction with Mars, being 1 deg. 58 min. south of the latter. This may be a good chance for anasteurs with (Concluded on page 262.)

NATURE AS AN INVENTOR

BY PERCY COLLINS

Civilised man justly prides himself upon his numerous inventions and mechanical devices, but it is possible that inventors in general would beast less of their achievements did they resites that the patents in which they have established their rights are really which they have established their rights are really nothing more than modern reproductions of devices which have been comployed by Nature from the begin-ning of time I is a fact that there is scarcely an investion of man that has not its prototype in Nature Sometimes these prototypes are of a rengshand ready character More often, however, they have been brought to the highest pitch of porfection. It is little brought to the sighest pitch of porfection it is little brought to the highest pitch of perfection It is little short of amaning that primitive man should have re-mained blind, through so many centuries, to the sig-nificance and value of these inspections of Nature. It has been said that aimort and of man's achievements as an inventor have their prototypes either in the ani man as in inventor have their prototypes either in the ani man of the prototype of the about strictless and the prototype of the prototype of the about strictless short article—anything approaching a complete cata logue of these coincidences. Yet a few of them may be

selected, almost at random, and they will serve to show how, after much labor and thought, man has perfected devices which at the time appeared to him to be original, although in reality they were nothing

As a first instance we may take grasping tools—a whole tribe of implements ranging from surgical for-ceps and sugar tongs to gasfitters' pilers and the vast pincors by means of which great masses of white-hot metal are manipulated upon the giant anvils of our workshops It is a arcely too much to affirm that, workshops it is searchy too much to surm that, without such tools as these, art, science and manufacture would long ago have creased to advance. The reader needs only pusies for a moment to resilize how important a part is played by these familiar imprements in the activities of human life, and when man kind first discovered how to make and use such things he must have benefited instantly Yet all these tools he must have benefice instantly ret all tacse tools have their parallels in Nature, and one is fain to imagine that some of these prototypes might still sup-ply useful hints to modern toolmakers. Perhaps the most perfect example of the powerful pincer in Nature is the claw of a crab or a lobsit. The power of the crab's claw is so great that a bite from a large crab will inflict a severe injury. It is related that fisher men who have been feeling for crabs in the recesses men who have been feeling for trabs in the rections of the rocks at low water have or calculately had ilver hand selsed by a large specimen, and being unable to liberate themselves have been drowned by the returning tide. Among other pincer-carrying animals are scorpions, while the inserts known as carried active curry a dainly pair of forceps at the rad of the body. curry a uniny pair or foreps in the end of the board and employ the look for folding their simple and dell cate wings. The opposable thumb and for finger con-stitute, in effect a most useful pair of pile as adaptable to many uses and it is strange that anns should so long have overlooked the lesson in mechanics which Shears and selssors are of course closely they teach spears and sensors are or come closely ailed in principle to grasping tools yet they have come to us only with the advance of civilization—no savage tribes having the least idea of them or their ("ontinued on page 284)











The first bottle-s gourd

The first ball-and-socket joint-a hursan

Nature a electric buttery—the

The first epinners a much whose caterpillar

The first pump-s liceri







The first hypothermic systage. The arrangement of issues and saws by which the female acceptations: a and enlarges a puncture. The next meants assembled form a table through which proon is higherted



fire first balloon, the "swellfish which is a d to infect itself with air and skip over the water, map lied by the breeze



The lanters fly of tropical America. Light without heal—the



The first seamstrees. The tailor bord, which stitches the knyes of her





The egg of the merry. A hox that entered roll off a shelf. If



The first hinge T' - 1 comproyeter of the Lorde whose binge to as-good as that found in any hardware slop

MATURE AS AN INVESTOR.

OF SCIENCE AND INVENT CURIOSITIES

SUCTION REACKET FOR MIRRORS,
There is nothing very novel in supporting a device
on a smooth surface by means of a suction cup However, the suction support illustrated in the accompanying engraving is provided with a very incentor



SHAVING MIRROR ATTACHED TO A WINDOW PARE WITH SUCTION BRACKET.

method of producing an efficient vacuum. The photo method of producting an emittent vacuum time producting graph shows a slisving mirror accured by means of a ball joint to the suction bracket and the bracket is supported on a window pane. So tightly does the device adhere to the window that it is possible to raise the window by lifting the bracket. The bracket can-The line drawing shows a sectional view of the bracket.



THE MIRROR BRACKET BROKER turn AWAY TO SHOW THE SUC-

which the mirror is supported Mounted on this shaft and free to turn thereon le a sieeve in which a spiral groove is cut to receive a pin projecting from the square shaft. The sleeve is provided with a pair of ball knobs by which it may be gripped and turned, forcing the

and illustrates the

provided with a rub-ber disk, the center of which is secured

ing the suction The

shaft outward and thus cupping the rubber disk as indi cated by dotted times. There is no possibility of leak age except under the edge of the disk. A bracket thus size except under the edge of the disk. A bracket thus applied will adher firmly for weeks at a time. The stand may be secured to any smooth surface and is particularly adapted for a shaving mirror because it than be placed directly on the window pane where the best light for shaving (an be obtained.

THE OLD "INVICTA" LOCOMOTIVE AS A MONUMENT A public monument of interest to all who make a sudy of the evolution of the modern locomotive has recently been set up in Canterbury, Eugland Fixed recently need act up in Canterpury, Eugana Fixed on a pedestal beneath the Norman walls of the bis-toric city is the old "invicts oughte, which in May, 1830 handed the first train on the Canterbury to Whilstable Railway—the pioneer from road of the



GEORGE STEPRESSON'S "INVICTA" NOW 482 UP AS A MONUMEN

south of Britain. The locomotive was built by George Stephenson. It will be observed that the cylinders and valve chegts are very similar to those on the modern locomotive. The cylinders are 10 inches in diameter with an 18-inch stroks. The wheel feet in diameter. The boiler is 10 feet long by 3 feet 4 inches in diameter, and the wor ing pressure was 40 pounds per square inch.
The locometive is now the property of the
Corporation of Canterbury It is coated with a apacial preservative paint

THE TELESCOPE THAT PLEAT PLOKED UP

THE TELEMONES THAT FIRST FIGURED UP
HALLEY'S COMET
The large reflecting telescope illustrated
herewith is interesting by reason of the fact that it was the first instrument to pick up that it was the first instrument to pick up Halley's comet on its present visit to our circle of the solar system. To be sure, the comet was discovered on photographic plates made with other telescopes before the photographic record made with the reflector here shown But it was Prof with the reflector here shown But it was Prof with the reflector here shown But it was Prof Max Wolf who first identified the counst on a photograph taken with this reflector at the Heidel-borg Observatory The discovery was made on September 1st, 220 days before perihelion. The Heldelberg reflector has a focal length of 918 feet, and the diameter of the mirror is 28 inches. The



THE TELESCOPE WITH WHICH HALLET'S COMET WAS

mounting is thoroughly up-to-date, and is electrically controlled. The observation platform is adjustable vertically by means of an electric motor

A NEW COMPETITOR OF THE MORE.

The "zebram" has made its bow to the public This creature is a new thing in the world, it never having treature is a new thing in the world, it never having existed until a year ago it is the hybrid offenting of the African zobra and the Texas denkey. There are at the government experiment station at Hettheeda, M, et z young ze brances. Their sire is the royal Abyasinian zebra which King Menetik gave to

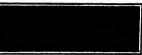


A VALUABLE STURID—A CROSS SETWEEN A RESEA AND A DOUGEY.

sevent. The latter turned the striped creature over to the experiment station, and here the idea of developing a new race of animals was con ceived. These six young ones are the nucleus. They are regarded as offering great promise. Certain of are regarded as offering great promise. Certain of them combine the dodlity, strength and utility of the mother with the spirit, activity and beauty of the father The yearlings are already larger than their mother They are beautifully but and should be adapted to the many uses to which the demestic an

TROCHA CUTTER A soldier in the Spanish and Philippine wars, who

had abundant experience in enoncreming to gas server the wire entaglements of the fipanish trooks, has re-county devised a very simple outer which may be a plied to the bayonet of the gan. A soldier in solid will desourable himself of everything except his ga



WIRE-OUTTING ATTACKMENT FOR GUME.

t, and hence the pliers which are use and before the pilers which are usually intrushed for cutting larb vire obstructions are frequently thrown away, so that the only method of gate iting through an esthalgement when amountered in the harmonic of the harmonic the vire with the bayonet and a stone. Not only is this process alow, but it is fatal in a galling life For this reason the inventor has devised a cut-only in the process alow, but it is fatal in a galling life For this reason the inventor has devised as the vire which may be secured to the layonet without in-triving with the use of the gun and which will not exceed to sever the wire by a single threat of the weapon. erate to sever the wire by a single threat of the weapon. As abown in the illustration, the outter consists of two jaws pivoted eccontrically so that when astending forward in their normal position that are open, but when pushed back they close In appearation, the gain is inverted, the point of the bayonet is resided on the wire, and then the gain is threated with the beyond the first on the wire of the cutter. As the jaws are between the jaws or the cutter. As the jaws are threat these they close upon the wire and severe it.

RESTORMOGRAM OF A WILLY DRIVER MAN.

The range of visible rays from deep red to violet forms a very small part of the solar spectrum Beyond forms a very small part of the solar spectrum. Beyond the red, the rays are too long to affect the retina, we we can detect than as heat. At the other end, we have the ultra-violen rays which are too short to affect the retina, but manifest themselves on the photographic plate. Ronger rays are not found in smultight, but if they were, and if our eyes were so constructed that they could detect only these rays, rishibe matter that they would take on a very different aspect from that to would take on a very different aspect from that to which we are accustomed. The accompanying the-tration shows how an am would appear. The man ap-sers sent transparent and one can essally make out tration anows now a man would appear. The man ap-pears semi transparent and one can easily make out his two watches and chain, his tie clip and the buckles of his suspenders. The metal parts of the buttons on bis cost are also quits evident, and his ribs may be plainty seen A pickpocket might envy each power of discornment, but he would have difficulty in conceal-ing his plunder if others were possessed of similar

The photograph was taken instantaneously with a Snooks apparatus, and is reproduced from "Archives of the Röntgen Ray" Haretofore, it has required a of the Rônigen Ray." Harsiofore, it has required a tollog appears to take a photography with the Rônigen Tays, but recently a system has been devised by which a very sudden and powerful discharge in produced as very sudden in the statements photograph. This sudden discharge in instantaneous photograph. This sudden discharge to the statement of the interrupt of an indeution cell. The face is metted when the proper intensity of current is reached, producing a very under hersel of the privary and a powerful discharge of the secondary Expourse of 1706 to 1/120 of a second have thus been obtained.



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am, P B. Harrison for strat or pest, O H WS

THE WRAVENE IN MAY

(Concluded from page 378.) talescopes of sufficient size to pick up the faint greenish disk of the planet.

During her circuit of the sky she pe During ner circuit of the sky she passes close to Venus on the 5th (and likewise near the comat the same afternoon), to Saturn on the 7th, Mercury on the 10th, Saturn on the 7th, Mercury on the 10th,
Mars on the 13th (pretty close), Neptane
on the 13th, Implier on the 19th, and
Uranus on the 28th
Princeton University Observatory.

HATURE AS AN INVENTOR.

(Continued from page 579)
Those admirable workers in skin the Kaffirs and Eskimos, employ only knives. The idea of the knife edge in combination with the leverage afforder by tools of the grasping type had nover occurred to them Yet shears are exem-pitied by the laws of many insects, as well as by those of tortoises and turties Only of comparatively recent years has man made boxes in whith to store money, trinkets, or other valuables Yet Nature has had be lookes from time im memorial Some of the most interest memorias isomo or use most interest ing of these take the form of seed-pods as, for example the stout casket in which Braxii nuts are packed in this which Brazil nuts are packed in this instance, too, the primitive idea of the pursie—later elaborated by the Chinese, as well as by other races of mankind—seems to lie dormant, for here we have vast number of nats, so cleverly packed into their pod or casket, that if

The hinge as attached to a lid or door The hinge an attached to a ind or door, has been known to man only for centuries, yet Nature has made use of it literally for billions of years. In proof of this statement, it is only necessary to inate a bivalve shell, such as an oyster a clam We know from goologists dictic a further sant, such as an overall country of a claim. We know from goologists that such shells are among the earliest indications of life upon this worth with which they are acquainted. The eggs of many insects, too, open with a futtier feet ittle bings, while the little first which coins the containing votational being of the trap-four spilor, is contained by the containing the man of the trap-four spilor, is also beinged in a most lagradious manner by ns of sliken bands

Savage man had no means of preser ing light for bimself after the setting of the aun, and it was only with the slow progress of civilization that he became pired with the idea of artificial iliu ministion. Yet this was not for want of examples set by Nature, for many ani-mals carry about with them bright lights during the hours of darkness. Marine during the hours of darkness. Marine organisms, in particular, emit phosphorescent radiance, while many kinds of insocts, to which such names as glow worms, fireflee or isnitern-dies have been applied, are highly luminous. In many instances the precise manner in which the light of these creatures is produced has bailed scientific inquiry Still, the fact remains that Nature had ber living glow lamps ages before man emulated her example

rmerly the surgical operation knows as cupping was so constantly performed that sourcely any man attained middle that sourcery any man attained middle age without undergoing it. The object in view was the removal of blood from some definite agot; the surgeon, by means of his apparatus, calling atmospheric pressure to his aid. Man night very well have invested this operation very well have invested that operations. Trees and Shrubs to Avoid in General Planting
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atmosphere and the creation of a more or less perfect vanum. Ilke the old fashtned cupuling glass the well known toy known as the 'sucker,' reminds us of the octopus. By means of the sucker—a small circle of molat leather with a string attached—large stones may be ifted in exactly the saure mauner that the octopus dislodges rocks or holds down its struggling prey That compara-tively modern invention the pneumatic peg is an almost identical device peg is an almost identical device. The apex of the reg is fitted with a sort of a cup made of India rubber. When this is pressed upon a smooth flat gurface, such as a pane of glass the air is forced. out of the cup and a vacuum form The pressure of the atmosphere then causes the cup to adders to the glass with sufficient force to enable objects to be suspended from the neg Purifier the man who had studied the octopus

might have added to the inventions al-ready onunerated, that of the common

atmosphere and the creation of a more

ready onnurested, that of the common pumit, while raises water simply by the action of the atmosphere and the action of the atmosphere and action of the atmosphere and action of the ac ous firsthility of the snake is rendered possible only because the vertebras of this reptile constitute a long chain of balls and sockets beautifully adjusted one to the other Another very perfect exam-pic of ball-and-socket movement is found in the case of the seaurehin. Each of the spines with which the shell of this creature is covered is swollen at the base into a cup-like form and this cup fits accurately upon a little rounded promi nence of the shell, which exactly fits into the cup just as the ball of the human thigh bone fits into the acciabulum. The iegs of insects in their srituation to the budy supply examples of the ball-and socket principle too numerous to men

The idea of the flask or boilie is emi-nently natural—1 c it has played a part in the economy of Nature from time im emorial Perhaps the examples are to be found in the vegciable kingdom among the pisnis known as gourds, the seed vessels of which assume forms calculated to remind the least

We have already seen that the theory of life common jump might have formu lated taself in the mind of man arref ne-had studied the habits and structure of the oclopus. There is narrower a pro-totype in Nature for that far more com-pilicated device known as the force-joump This projective is the human heart Anatomists agree that it is constructed on principles which are marrelously up to-date. In an incredibly short period the whole of the blood in the human hody passes to the heart and is driven from it again with a force which carries the stream to the tips of the flugers and the stram to the tips of the flugers and thes, while as everyone knows the action of the heart persists, night and day, throughout the whole life of a man. If we regard the heart as the pretotys of force-jump wrought in metal by the hands of mankind we must still be to prove the property of the proper

its renovation and repairs are affected while the mechanism is in rapid motion.

The simplest form of sewing is that The simplest form of sewing is that which is in vogue among such primitive races as the Eskimos and Kaffra It con sists in boring holes through the material which is to be joined together and push ing the thread through them will observe that the operation is of so rough-and ready a character that no nee-die is required, and one is almost temptagine that mankind might a

25

the probed like prospects thus formed, it is methed of working resembles exactly that which has been detailed above First the sharp-political back is used to form a silt or hole in the leaf, and through this a piece of tough grass, or other vegetable fiber, is passed A second hole is made and the natural "threed" is drawn through it, and so on antit the work is completed by a tucking in and adjustment of unruly ends. Bhould the reader completed by a tucking in and adjustment of unruly ends a Bhould the reader in the property of the property discover that the latter are far less clumy than the former In a word it may be asserted with out feer of contradiction that mankind out feer of contradiction that mankind was not first in the field where the art of needlework is concerned. The even sum is another of Nature's own contriv

s so arts of spinning and weaving have also their prototypes in Nature The majority of nest-building birds exhibit a more or less strongly marked weaving ped in the case of a genus of like blods indigenous to the warmer part ilke hirds indigenous to the warmer parts of Asia and Africa The spinning of fine threads so as to form thickor strands and the combination of these into webs, are operations characteristi many insects and their allies. Many spi ders, as everyone knows, construct silker webs which they employ as a means of webs which they employ as a means of capturing their prey, or of protecting their egg-clusters from injury. But it is among insects of the sub-order Heterocera (i e the moths) that the spinning of silk ins been brought to the highest state of tice be turned the first aginans—the inventor under the pridish hand of Nature of this invaluable art. Take, for example, the cocess of the well-known Cercpla molt—the so-called American silkworm it is entirely constructed of silk, which is secreted by glands in the mouth of the grun or caterpillar. As soon as the insect has become full-fiel, and is about to putch the completed of the completed the process of the contract of the consideration is no intrincis that consideration is no intrincis that consideration is not intrincis that consideration is not consideration. lice be termed the first spinnersstruction is so intricate that considers struction is so intricate that considera-tions of space forbid us to describe it in detail. Suffice it to say that the cater-pillar first constructs of sliken threads a kind of scaffolding, or framework, and then—laboring from within—goes to and fro about the skeleton structure depositfro about the skereion and by means of ing its endiess silken thread by means of ing its endices eliken thread by means or a figure of eight movement of its head in this way a kind of tent of marrelous toughness is built up, wherein the caterillar changes to a chrysalis and passes andry through the quiescent period of its existence, to emerge eventually as an adult moth

In passing, the reader may be reminded that many kinds of caterpliairs contrive a kind of trap at the month of their cons similar in principle to those made by man for the capture of crabs, lobaters, and relia Wiltin the neck of the Binstein control arrangement of stont, briefly appendages which form a well-sigh imposetrable barrier against the attacks of commice which may attempt to force an estrance from without Yet owing to the estimate of the stone of

The writer is not sware whether Nature's contrivance of a box that cannot reli off a shelf has ever been put to practical use by mankind II is obvious, however, that such a device might very well form the besis of more than one valuable inwestion. The principle may be studied by all those who are shie to be studied by all those who are shie to as breeding places—or, indeed, by these (Constituced on space 300).











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You'll want Phoenix Mufflers next Fall

GE MACHINES Carillon Engines, Browns, and Buttern Machiner, 1884 11. RE MODELS & EXPERIMENTAL WORK
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GUNSMITHS TOOL MAKERS, EXPERI-MENTAL & REPAIR WORK, ETC.

JAGER Marine 4-Cycle Engines

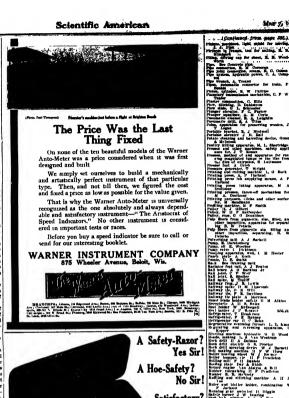


(Continued from page 185) of these birds on an ordinary shelf or table I for sexts a fost a sex criting on a table, the odds are in favor of its fulling to the ground. Not so however, with the eggs of i-dee frequenting are birds. For the forms of the states, that it is streadly impossible to impart to them may but a civilar movement. If disturbed these eggs roll round and found until the imparts after to them is expected. It is a stressly measured datas upon the imperious color of the of these birds on an ordinary shelf or dilate upon the importance of this de-tire insamuch as such eggs, being fald on the narrow ledges of perpendicular rosks would—but for their peculiar form—be precipitated into the sea upon form—be precipitated into the few upon the slightest movement of the parent bird. As it is careful observers have stated that although there is a constant coming and holing smong the birds and a constant rotation on the part of the

ggs not one of the latter is dislodged The stings and mouth parts of insects typify in many ways the devices and inventions of man. The aling of a bee or a wasp might well have been taken as a model of the modern hypodirmic syrings, so too, mighl like claborate ar rangement of blades and saws by means of which the female mosquito makes of whith the female mosquitto makes and enlarges her puncture. The instruments, fitted together and working in misson, form as tube through which the insect aucks the blood from her victim and intelestally incustors have also included in the second in th panying pholograph. The fact that the sharp blades, tools and saws its sittin a sheath when not actually in use is of capecial interest, for herein we see typi ded the sheath or scabbard by means of which mankind protects the keepness of his edged tools and weapons his edged tools and weapons. A sim-more perfect type of the hypodermic syringe is the fang of a polsonous sunks. When the reptile makes its stroke, the base of the fang is driven against a reser voir with the result that the liquid poison is driven through the tubular fang and forced into the wound. Even in the case of large snakes, these deadily exagons on the surprisingly slender and delicate, on that the wonds made by them would be quite inconsiderable were it not for line fat that and endely liquid is injected—exactly as in the case with the bypoder control of the case with the bypoder. voir with the result that the liquid poiser

reactly as is the case with the bypoder mice syrings. There are many natural devices by mans of which plants and animals travel through the air and mankind is at revenient engaged in a close study of these with a view to perfecting his own strings and from the string and habits reachibe halloons most closely are the scaled gibbs fisher of tropolar sace For the most part their bodies are covered with strong splunes, or at least with hard plates, but the strangest theretexists, but the strangest theretexists. of these ocean dwellers is their power of dilating the gullet with air, when the dilating the guilet with air, when the body swells out into a globe-like forms and the spines are creeted, furnishing a formidable protection. When so inflated, gibbe fish are unable to swim. They drift about upon the surface with the underside turned upward, and skim over the waves impelled by the passing terms. over me waves impered by the passing breeze. It cannot be doubted that this singular habit reminiscent of the bal-form is beneficial to these fish in that it enables them to escape the onslaught of sharks and ailled carnivorous creatures of the deep

in conclusion, we may glance for a mount at Valure's own electric batter les—lao remarkable examples of the capacity of animal structure to produce electricity to store it so to speak, and to electricity to store it so to speak, and to discharge it at will Both those erea tures are flab one belonging to the sel iribe, the olber bring a species of my known as the torpedo flab. As a matter of fact the lorpedo rays belong to several species which are met with in the Allan (Oencluded on page 287)





throw-off m pils also Silling and separating, R. W ubiting and revening squaras, the Kepper Street of Street Control of the Control 956, 490 1655 843 966 306 955 868 955, 962 055,918 954,154 956,356 II. Bace G Andres topics and advertising device, C. topics of the Control of the Con

tie. (Concluded from page 386)
tie. Mediterranean and Indian Oceans.
The broad, smooth body has a rounded outline, and on each side of the head outline, and on each side of the head there is an electric organ capable of giv-ing electric shocks. The accompanying illustration shows one of these fish dissected to show the seat of its electric power On the left, the nerves supplying the organ are dissected away The prismatic areas on the surface of the organ indicate the vertical columns of electrical plates, of which there may be 500,000 in each organ. The arrangement of these piates, or disks, is like the metallic por pincon, or class, is like the metallic por-tions of the voltaic pile while each is separated from its neighbor by a delicate membrane, which takes the place of the cloth. The object of this electric power on the part of the torpedo ray appears to be to enable the creature to secure its prey either by killing it, or rendering it temporarily insensible. It is said that just before the shock is delivered, the ever are depressed in the head like those of a toad when swallowing a large in

The electric sel of Southern America stimes attains a length of six feet, and its electric organs are proportionate and its electric organs are proportionate-by four times as large as those of the improdo When about to deliver its shock it points its body in the direction of the intended victim, stiffens itself and with intended victim, stiffens itself and with a sort of shudder, the electric fluid is smitted. It is said that the flat which is the object of the discharge rarely or never escapes but simultaneously with the shudder of the sel turns on its back and lice motionless—an easy prey to the electric monster

It would be possible to dilute at much

It would be possible to dilate at mush greater length upon the natural prototypes of human inventions. Enough has been panned, however, to show how frequently man's thoughts reflect the device which arready saist in organic as vive which arready saist in organic as far to seek if so many existing his man inventional have been anticipated by Nature, we may conclude that with Nature list the secreta of inventions yet to come, nor can it be doubted that a close stday of antianal and plant life will from time to time bear fruit in the form of mechanical devices which will prove of pestimable value to mankind at inestimanto value to manging at large For this reason, if for no other, the in rulcation of Nature study in the minds of young people is highly desirable

THE WICE AVIATION WEST.

(Concluded from page 372)
ade but one stop, at Litchfield started readily from that place at 4.09 A and covered the remaining 68 miles in 1 hour and 21 minutes beating the train nour and 21 minutes beating the train that accompanied him. The last 24 miles were flown in 24 minutes on account of a favorable wind. Eight thousand people are reported to have watched him arrive and to have given him a rousing we

Next to the Bieriot Latham race across the English Channel last July, this cross country flight is the greatest achievement so far in aviation In the light of what has already been accomplished it would seem that from 800- to 1,000-mile flights vithout a stop for fuel are now quite sible of accomplishment the only limit ing factor being human endurance . It both his attempts at flying from London both his attempts at flying from London to Manchestr Graham White was obliged to give up on account of the great strain undergone by him in matraining the equilibrium of his biplane in the strong and gusty wind When some device in provided which will maintain equilibrium automatically, the strain upon the aviator will be greatly relieved and driving an aeroplane will then be no more fatiguing than running an auto-

Sicontive powder is prepared by mix-ing 30 parts of lithopone, 30 of sinc-white and 40 of manganese borata. Pass the whole through a fine steve. This pow-der is a good drier for white paints.



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How to Make a 100-mile Wireless Telegraph Outfit

In the following Scientific American Supplements, the well known wireless telegraph ex-fr. A. Frederick Colling, describes clearly and simply, without the aid of mathematics, the

Mr. A Prederick Cullina, describes clearly and simply, without its a id of mathematics, the con-traction of a sound wireless allegraph desired. Completed frowings accompany his descriptions. The desired of the contraction of a sounder of the sounder of the contraction of the co

These its articles condition a proposed AFFRANCE PERFANCE FOR A CONTROL PROPERTY OF THE CONTROL PROPER

MUNN & COMPANY, Inc., 161 Broadway, New York, N. Y.

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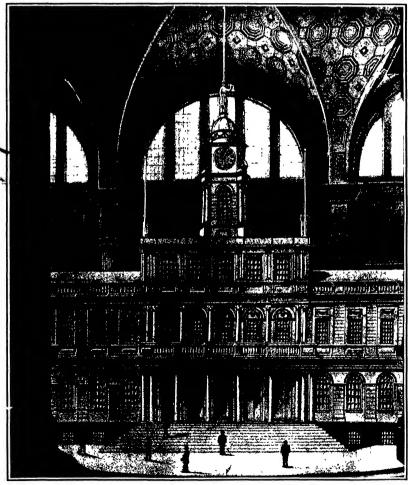


A POPULAR ILLUSTRATED WEEKLY OF THE WORLD'S PROGRESS

Vol. (II -No 20

NEW YORK, MAY 11 1910

10 (FNIN 1 (OP)



Interior view of the magnificent waiting room which is so spaceous that it could contain, bodily, the New York City Hall. The critics, 150 feet above the flour, would clear the flagpole by 10 feet.

SCIENTIFIC AMERICAN

ESTABLISHED 1845

MUNN & CO. Inc. Figure and Proprietors

Published Weekly at No. 361 Brondway New York

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21 N.N. A. S. D. L. D. L. M. S. D. Bronderson, New York.

NEW YORK SATIRDAY MAY 14th, 1910 The Editor is also as a control or record for examination illustrated articles as spherical of time is interest. If the photocraphs are sharpy, the attreet short and the facts interest the indicated in control of the photocraphs and attention. Are plead articles will be possible as regular spans of take.

NEW QUEBEC BRIDGE DESIGN

ACCOMINATION to a reset them to one of the Very Varia duline the quibe Fridge Board Very Varia duline the quibe Fridge Board on the property of the property o it is stated furthermore that the Domini government will require not only that the contracting firm accept full responsibility for the project whether it beconstructed on the Board's design or from its own plans but also that the firm make a very large cash deposit as guarantee of successful completion of the

The design now approved by the Commission says the dispatch is that which was sharply criticised a faw months ago in an American scientific periodical", and we are informed in this connection that the Cana dian government has decided that the criticism unde did not justly apply We are further told that "the Hoard while convinced that the designs will make a safe and untisfectory bridge is not disposed to closto other designs

Since the Services Avenuas is the only journal that has printed the plan of the new design drawn in by the Board and subjected it to extended criticism we presume that we are the American scientific periodical referred to. The plan and discussion was printed in our issue of February 12th, and our readers with remember that we look exception to the design on the ground that it was not only of inferior merit consid ered from the bridge engineers stand point, but that if constructed it would be the 'ugilest bridge of monu If constructed it would be the 'ugitest bridge of moun-mental recognitions among those hilberts proposed or built. Only clean was also made to the decision of the control of the control of the control of the such that a similar it rigidally in the Porth bridge, which is of loss again, having a ratio of width to length of 1 of 1 whereas the qubest bridge would have a ratio of outy 1 to 20. We objected further more, to the height of the thorse, which is the Barrets control of the property of the control of the property of the control of the control of the control of control of the property of the control of the control of control of the pre-tile the property of the control of the control of the pre-tile of the control end of 130 feel in the Forth bridge. We showed atso that the effect of low helght and narrow width had been to unduly increase the weight of the atructure the Queber bridge requiring the enormous average weight of 24 ions of steel (half of it nickel steel) per illnear foot as against a weight of only 10 tons of arbon steel per linear foot in the Forth bridge—an increase out or all proportion to the heavier loading of the proposed Quebec structure. The value of the Board's decision to lattle outside designs depends upon the ingith of time that is

allowed to bidders for the proper preparation of plans for a structure of this great importance. The Board has taken about two years to prepare its own plan, and if outside bidders are to be limited to a few and if outside bidders are to be limited to a few mosphs time it is scarrely likely in view of the heavy penalties imposed that they would be prepared to put to bids which they must perforce have thrown to-gether very hastly if the competition is to be thrown open to the deaksurm and bridge builders of the United States and Europe not only should abundance of time be given for the working up of the necessary plans and estimates, but il would be advisable for the plans and estimates, but it would be advisable for the Canadian government to arrange for the plans, both of the Quebec Bridges Board and of outside Bidders, to be subjected to the award of an independent Board, her terminy international in character

FUEL ECONOMY AND OUR NATURAL RESOURCES

ECONORY AND OUR NATURAL RESOURCES

IE problem of preserving the natural wealth
of the country may be attacked from two
sides, the legislatho and the mechanical.

The operation of the first method may be The operation of the first method may be seen in the admirable movement of the Federal govern ment to prevent the ruthless waste of the country a natural resources which results from the improvident muticods by which they are gathered from mine, field, and forest (full posterity will be able to estimate at and rorest Only peakerity will be copic to estimate at lis full value the revent logislation for the conserva-ion of that natural wealth with which the United States has been so richly endowed But after the fostering care of the government has

done all that it may to conserve by the prevention of waste it remains for the consumer to so utilise the m the maximum raw materials, as to obtain from them the maximum amount of metril output, whether in the form of power or of finished product, with the teast possible amount of wastage. This indeed, is one of the most impor-tant and attractive objects of effort in the great industrial world. To the engineer of high professional in stincts it is not sufficient to do a certain work and do it fairly well, rather, it must be done with as close an approximation to perfection as the conditions of

Economy of performance has been the constant alm of the industrial engineer, particularly in recent years, and from time to time we have recorded in these usees certain successive steps some of them in these pages certain successive stops some of them people making in their importance in this constant on deavor to bring working sfficiency into closer approxi-mation to theoretical efficiency. What we have said applies with particular force in the field of steem on efficiency in which it may be said that at the last sanipists the object of all improvements is to lessen the consumption of fuel for a given amount of work. Fuel concern, moreover apart from its direct connection with the profit and loss account of any industrial enter prize has a most important bearing upon the question of the conservation of natural resources. The world's consumption or natural resources. The consumption continuous as it is at present is increa-ing all an accelerating rate, and every reduction that is made in the average amount of fuel which must be burned to secure a given amount of work means that the life of our cost and oil fields by protonged to exactly that extent

At the present time there are two important develop ments which promise to give economical results who cases they have to do with the transportation of freight in bulk, the one relating to the engines of slowspeed curgo beats the other in the motive power of those freight Irains which are so characteristic

The reduction in the cost of transporting water barne freight has been made possible, or soon will be by the successful application of mechanical reduction by the successful applies also of me handes reduction great to arga ships of modernic speed—a problem to which some of the abless engineers and the most removed menufacturing firms in the world are now divoting close attention. Mar Farland and McAjinto, and Westinghouse, in this country, and the Hon Charles Parsons in Ninghand have independently produced a great which will resubtle side and moderal-speed steam ships to utilize the highly economical fact running stream thruther for first gain overgood propellers with a loss of efficiency in the transmission great or only two loss of the contract of t per cent. Parsons has gone so far as to test the new installation against the old reciprocating engines. In a cargo ship of 4500 tons displacement, and he has proved in a series of comparative tests that the cargo ablp of the future can be driven at present speeds with a saving in the roal bill of from 17 to 20 per cent Now since about two thirds of the world's shipping are made up of freight stramars, it can be seen that when some form of this system has been generally applied, as it undoubtedly will be, there will be a great aggre reduction in the consumption of fuel by the world's merchant marine For fuller information re-garding this epoch making device, reference is made to articles published in the SCHNTING ARTHUAY of Feb-

article published in the Scientific Article published in the Scientific Article 2018. April 23rd of this year Rousily important are the comomies in the transportation of rational region which are now reader possible by the perfection of appliances for the use of superheated heart Although the application of superheat has been practiced for several years in Europe, its of comparatively revent introduction in his country, but although our engineers have been a little later in taking hold of the problem, they have done with the country but although the country but although our engineers have been a little later heading divesters roade, nood work that on one of our leading destern roade, not have the prophets and Saint Properheated steam the Atchison Topeks and Sants Fe, superheated steam is being used on a number of the largest freight enin being used on a number of the Jargest freight on-gines with competents success. It is garles of tests with two identical compound freight elegiass running over the same stretch of road utders identical condi-tions, one a 4-rylinder compound using extracted steam, and the other a similar drylinder compound with a superheaver of the Jacobs type added, the rupper-heter engine showed a decrease in oad, consumplied of 18 6 per cent for constant hard working on heavy mountain grades; it gave an average of 11 6 per cent more dry steam per peund of coal than the non-super-heater engine, and the boller and its accessories proved to have a total higher efficiency of 138 per cent. These figures were obtained by II MacFarland, the engineer of tests of the railroad who explains the remarkable recommits setured by the facts First, that superheated steam of high temperatures behaves semewhat this a gas, it being possible to extract a con-semewhat this a gas, it being possible to extract a con-tained place, accordir, that for the same cruciff in the vilider. But weight of steam required is less with of 19 6 non-cent for constant hand working on heavy -ylinder, the weight of steam required is less with superheated than saturated steam of the same pres-sure, and thirdly, that, as compared with saturated m superheated steam has greatly reduced the inclivity, and the amount of heat absorbed by cylinder walls is only a fraction of what it would be were the steam saturated. The details of this system of superheating as applied to iccomotives of the Mailet type will be found in an illustrated article publis In our lesue of January 29th of the present year

in our issue of January 29th of the present year important as are the economies that have been made possible in the broad field of transportation, they are exceeded in the even larger field of stationary engineer for economicated by the buge light and power plants ing represented by the huge light and power plants for municipal and manufacturing service where the utilization of the exhaust ateam in low-pressure tur-blues has made possible economies of from 30 to 100 per cent—this last result baving been attained at the

DATE DADITH THAT IN THE BURY STATE? HE French scientist G Le I

E French scientist C Le Bon doubts whether metallic radium exists. In fact, we are only medalite radium exists in face, we are only requalitied with the salts of the supposed metal such as the chlorido or bromide and the probability of its existence is deduced only from the presence of some rays of the spectrum and an atomic weight which is somewhat theoretical secinal that it has veried according to the observers. M. Le Bon has been of the opinion for eight years past that the existence of radium is doubtful. He considers that the properties of the supposed metal might be due to certain maknown combinations analogous to the equally suknown combinations which give plus phorescent to some of the sulphides it is observed panerscener to some of the sulphides it is observed in fact that a pure sulphide is never phosphorescent but when mixed with some traces of different todics it becomes brillianity phosphorescent. This point has been discussed in various papers presented to the Arademic des Sciences 11e had occasion to mention. his views about radium to the late Prof Molesan, and this well known chemist had in fact come to the same this well known shemlish had in fact once to the same-conclusion, having the files of separating radium from its compounds. Death overtook him before the could carry out these researches. A centh of a granupe of substance would be needed by a good chamilat, but probably neveral operations would be required in addi-tion. An expense of \$10.000 would be incurred. Use Le bin thinks intact from chloride of radium we would Le lion thinks that from chloride of radietic we would extract simply berlium and nothing more. The ex-periment, wen through transforming a body worth \$250000 a gramme into a comparatively worthless metal would be of great interest, for it would prove that radiosa livity which gives out considerable force can be produced by certain combinations

M Georges Claude of Paris brings out the follow ing points regarding the future uses of oxygen, ser ling points regarding the future uses of oxygen, se-ing that this latter is now being produced on a cou-mercial scale from liquid air. He shows that oxygen can increase by 40 per cent the yield of the reactions which serve as the base of the fixation of nitrogen by the electric are, and it can improve the manufacture of escope by nearly 300 per cent. Such results promise to be of great interest in many of the industries. The Belgian firm of Ougree Marihaye has recently ordered from the Paris Liquid Air Company three apparatus from the Paris Liquid Air Company three apparatus from the Paris Liquid Air Company three apparatus of 200 croic yards of pure oxygen per hour. Buch apparatus will be used for apperments in biast furnace working, to observe the action of a considerable province of oxygen intaced with the fair, which is sent into the biast furnaces. As to the price of axygen, although the may be comparaturely high when yet consider only mostly quantities, the result changes when we come to under sayme apparatus of the plessent with the province of the control of the price of in which no less than 1,000 cubic yards of me jet-bour can be produced, whiching is a pressure of 10 stracephere and fermining 1.5 cubic yards per feering power hour. In such case the typic per cubic yard, will fall as jew at 8.5 cept. By using hybright gover, the cost of production sits a legilit jowered. Chrigae-phants of the pressing first yill be of great advances; the two way of manife since comparing complete in medi-factory comprehen the complete complete factors and factory comprehen the complete complete factors and factory comprehen the complete complete factors and carried house for preferred to the complete complete factors.

"SCHOOLING TANKS ICAN

ENGINEEMING

The German estimate of agronautical statistics for the year 1810 is that Germany will have fourteen dirigibles and five aeroplanes: France, seven drigibles and twenty-nine aeroplanes; Italy, three dirigibles and eagen aeroplanes, Russia, three dirigibles and six aeroplanes and England, two machines of each kind

The soctivity in call read construction in he North work in answershie for the construction of newest in portant bridges across the larger rivers. A notable in stance of this is the Colombia River ridges across the North Coast Railway is Washington the permanent substructure of which will consist of twelve percarging a superstructure made up of nice Hone trust again, and a few span across the main channel.

A leading southern Journal speaks words of which can that the publy of navy yard construction that the publy of navy yard construction that the publy of navy yard construction cortex a triffe more than building in private yards Kesping our leading navy yards busy with warship our reading navy yards busy with warship our tending navy the form the public of the public
The loss of the Attautic transport liner "Minnhala" upon the much-freaded creak at the vestered of the Belly islands reminds us again that in spits of the additional safequards which have been introduced of late years in trans-Attautic navigation the perils of the sear set still insistent. The great success of the submarine bell on our Attautic cast auguests that this device might be used to very outofferd at the more dangerous points at the approaches to the Bell'still of the proposition of the Bell'still of the took the Bell'still of the proposition of the Bell'still of the took the Bell'still of the Bell'still of the Bell'still of the took the Bell'still of the

Mobody seriously discutes the advantages of the "Paya-as waserfic" our Not the least among these is the reduction which it has under at least on certain lines, in the number of actionals: Statistics compiled by the Chicago I'ty Ratikasy show that the complete libraduction of this style of car on all trunk lines has resulted in a decrease of accidents of about three compiled with a compared with the number occurring during equal to riods of service with the old style of cars which it replaced

The building of railroads through mountainous country or asimality increasities some during bridge con attruction. A recent instance of this is the Assonius via duct which forces part of a new lime extending by way of Demiril to the Turkish frontier. The attructure which is 400 feet deep series to connect two tunieds white open from other side of the gores. The super-attructure which is very graseful to design consists of introductivation of the super-attructure which is very graseful to design consists of introductivation of the support work higher deaths. The bridge is on a grade of about two per sent and the line is laid on a survey of four degree.

Reconst tests at Sandy Itook of the resisting power of reintered concere as a defense against high powerd projectibes confirm the calculations of the penetrating power of the twelve-inch you it is stated that a concerie wall twenty feet thick heavily reintered with steel beams, was pierced by a twelve-inch projectile fired at high velosity. We understand that a similar attack is to be made with the new fourteen inch your beat the projection of the contract of the price contract of the price contract of the projection of the contract of the price cont

The election operation of trains through the Saint-Clair tunned is showing the saint percent of the compared with steem operation, as have been obtained in similar installations electric According to the Siectric Ratiway Journal the rout of road for one para under electric operation was only thirty sine per cent of that for the last year of steem operation. The cold service the progress were but sixty per cent of those steems of the contraction o

Considerable interest has been around by the lannot of the new torselvo-locat destroyer. Paulding" at the Bath Iron Works. She will be the first destroyer in our largy designed for the acculative use of oil fue! Except for this, she is practically a stater vessel to the "Phase" and the Katella and into them she with the driven by tarkines, and must make a speed of 19½ knots on four hours' run at sea. It is well here to correct the statement which recently went the round of the press. A state of the control of the press of the control of the control of the press of the control of the press of the control of the press of the control of the control of the press of the control of the

ELECTRICITY.

An application was recently made for a permit to lay condult a long the new Baltimers and Wilming to read Three are to form part of an order/round truth system connecting Batton New York Philaded Truth system connecting Batton New York Philaded States of the Philaded States

Storage battery locatorities at: being used in cerciain nines of Creanay. These located was are considered less datacrous than the ordinary feet it locamotive for the naon that no string is necessary in the mines and they can be income of complete to nyrrest ignition of games by means of a chaine spark. The locatorities are each provided with two sets of hat tripes one of which is being intare, of while the other is operating the locatorities. The batteries are sidem more than two childred discharged we to that the re-thery hig takes but a short time. In one type of isomotive of twonty home-power the batteries, contain ninetycetic such with a capacity of 71 anapert, boars. The storage battery (constitute range from x to 22 horse storage battery (constitute range from x to 22 horse

Whenever a table message Is so the to an Italiand tity, it is necessary to transe the the message from the table receiver and re-transmit it to hand over the data lines to its point of destination Heriofore Italian been impossible to send a message direct to the hand city by mans of relay consection with the overland wires, for the reason that the cable signosis or of too finitentialing a themselver and loo a multity to operate an ordinary before the allow and therefore the contract of the second of t

The installation of a complete behavior system for the stage of the New Theater in this city Huserstee not only the variety of uses to which the releptions in put but also the vasiness and complexity of in up-todate stage. The stage felephone system has the stations on the stage and twenty five floor stations with two switchbaards or central stations. Through these centrals inter-communication with the other stations may be had. From one of these central stations the technical direct routing the operations of the stage hands, while the other board is the stage manager a station. The regular stations are placed in the purpose of the station of the stage stations and one is to-ested near the order to safe, "Citis are and one is to-ested near the order to safe." Citis are and one is to-ested near the order to safe, "Citis are only a station of the stage of the stage of the order station of the specific stage of the stage of the central stations are such as the stage of the stage of the city to buttons is pressed. The theater is also equipped with a telephone system used for carriage calls.

The Pennsylvenish's based soil terminal signal in establishin is the largest ample transitation of the kind ever made in this country. While most people realise that signals play as insportant part in protecting train movements especially where traffic is congested, the investment made in these devices in far beyond the general understanding. Davelopment in signaling and revert years has been tremendous and has prevained chiefly sions electrical lines. Complete signaling and chiefly sions electrical lines. Complete signaling and chiefly sions electrical propulson complexes the altustion for tertical propulson complexes the altustion of the trick of propulson complexes the altustion of the trick of propulson to the propulson of the control of the

SCIENCE.

Prof. W. W. C. appell, director or the Lick Mervatory, has telegraphed to Harvard College Observators that the bright sodium D line has been photographed in the spectrum of Halley a many by Wright.

in the spectrum of manage a minim by wrights.

Prof. Charles Chandiar was honored in New York kity
recently on his retirement in his 74th year from agive
service. A languact was tendered him in the Waldiard
Astoria hotel. The banquet was attended by many of
New Yorks would distinguished a feeting the

New York's mixed maximument as unusual Commander Pearry's arrival in a brighted was attended with much reression. A regiment of reporters met thin at Plymouth Members of the Royal Geographic cal Society as well as the London Ward Attack welcomed him to London. With Commander Pearry is Lapi Bartiett, who are companied him to the pole A special gold medial was presented to frommander learny by the Royal Geographical Society and a replan indirect them.

The lowest atmospheric temperature and otherwork. — 86 deg (* 1-m) deg P 's may recorded an Justice 168 deg (* 1-m) deg P 's may recorded an Justice 168 deg (* 1-m) deg P 's may recorded and temperature of 'y deg (* 1-m) deg P 's may recorded and the lamb been experienced by any Artifu or Antarette expedition. A temperature of 'y deg (* 1-m) deg P 's may observed in 1870 at 22%, degrees morth failed and the second of the control of the deg P of the control failed and the deg P of the control failed and the deg P of The assertion of the Cook who islaims to have observed at emperature of "sel deg (* 1-m) deg (* 1

The United States Washlar Burson has lound in stratums to all its right statums ealitist for observations on the 17th 18th and 19th of May of any optical, scherling or other pin norm at that may be a carboned by the passage of the north through the tail of thisty as the state of the state of the state of the state of the discontinuities thou and it may not extend to the raar the cath on the data of transit should it do so how as the cath on the data of transit should it do so how as the cath on the data of transit should it do so how as the cath on the data of transit should it do so how as the cath of the data of transit should it do so how as the cath of the data of transit should the so have trained observer if not by the layman has he planomens are mark the or increase of an abnormal amount of data in the almosphere— or of an abnormal amount of data in the almosphere— or of an abnormal amount of data in the almosphere— or of an abnormal amount of data in the almosphere— or of an abnormal amount of data in the almosphere— or of an abnormal amount of data in the almosphere— or of an abnormal amount of data in the almosphere— or of an abnormal amount of data in the almosphere— or of an abnormal amount of data in the almosphere of an abnormal amount of data in the all the data of the data of the data of the cath of the data of the dat

A monograph bearing the lift Quality of Surface A monograph bearing the lifted State's than here is said the littled State's the littled State's the bearing the littled State's the littled State's the littled State's the littled State's The volume which the twar of II B Dile consistent for except of II B Dile consistent for except food industrial markets and of the New Mountains Daily samples of water from hearly 200 Mountains Daily samples of water from hearly 200 Mountains Daily samples of water from hearly 100 Mountains Daily samples of water from hearly 100 Mountains Daily samples of water from hearly 100 Mountains Daily samples of the consistent water and and for no mountains of the composition subjected to analysis. The analyses giving as they do the average compation from day to day and information regarding most complete collection of data regarding the quality of American triver that has even been multilated. They are on this account particularly valuable to managers of industrial points and water works.

During the past where Prof. Hirroral of Stranhurg, president of the International Committee on Scientific Acromatics arried out a series of daily merorological observations with someting the conover the Attentia Covan in the region between "coordinations of over the Attentia Covan in the region between "coordinations are not been assumed to the control of the contain 1,000 meters and the maximum 1,000 meters which is the record for such observations at was. The lowest traperature yet measured over the sea was also statistics via 150 clear (134 days). The proper seconds here over the Attentia up to an average siltude of 5,000 meters. Immediately above this had at an altitude of 8,000 meters immediately above the there was an unusually strong antifrade which had at an altitude of 8,000 meters as wineity at 750 to in meters per second the monotted sincepth of the current imp have had something to do with the sincernally mild since that a prevailed never that continues. The Inothermal As prevailed meters of the continuent of the foothermal and prevailed meters of the continuent. The Inothermal Assertance over that continuent. The Inothermal Arease, over Europe.

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The Porhydrometer—An Apparatus for Weighing Ship Cargoes

BY THE ENGLISH CORRESPONDENT OF THE SCIENTIFIC AMERICAN

An ingedious apparatus has been perfected by an Italian sugineer, Signor Emilio de Lorenai, the University of the American State of the
The spiration of the instrument is based upon the principle that a body floating in a liquid no miles principle that a body floating in a liquid no miles what it do noily may be displaces a quantity of that inhule caractic qualt to its new neight. The apparent comprises merely a float or "aerometers" placed in a combre flit of with, actr, white is in communities when the outside of the ship. Consequently, as the vessel states deep rim to the water white being tools are stated on the state of the ship. Consequently, as the vessel states deep rim to the water white being tools and in the level of the water in the float channer must rise of all in calcidence with the feet in the surrainating liquid in the decision. The ship is the state of the water in the floating that there is not a float their being float live becomes more rises deeply immersed in the water in the chamber with a consequent siteration in the apparant weights.

The accometer is connected and belianced by levers so that by the adjustment at the balancing weights of the values of valer displaced by the accometer at any operational or manufact is accurately gazed the alternative and in apparent weight leading read on the weighting machine nor recording instrument and therefrom the veighting machine on any cargo taken an board or disclosured is castly determined.

The principle of the apparatus may be more comprehensively realized by reference to the expinantory illustration which above the mid-ship section of a rease-with the hopership of the mid-ship section of a rease-with the hopership of the mid-ship section of a dealer of the ship of the said transverse center of the ship and extends from a point 1½ to 2 feet below the line of finishing when the result is map; to a convenient in high above the food line. This chamber is connected to the surrounding state of the said of the vessel, or in some other convenient sea water connection a special tube being unnecessary to the some of the connection of the said of the vessel, or in some other convenient sea water connection a special tube being unnecessary to the ship of the said chamber can be secured so that the water jewel within may be egat by as that outside the ship in the later way to the said to the vessel as the ship in the later was the said of the vessel as the ship in the later was the said of the vessel as the ship in the later was the said of the vessel as the ship in the later was the said of the vessel as the ship in the later was the said of the vessel as the ship in the later was the said of the vessel as the said of the said of the vessel as the said of the vessel as the said of the said

ascentier? I beling suspended from and balanced by a notinguist lever. D having its future at E to ther end beling connected to a steelyard weighing machine at F The arcometer is generally machine the important and the second of the their limits of the second of the condition of equilibrium. The float actuals do not the second of floating, and of floating the floating, and of floating the second down the place for the maximum draught. Moreover, the profile is such that the area of the float at any point of cross section bears a constant ratio to the area of the which the same level

As the vessel becomes immersed through the superimposition of any weight such as cargo, the draught facereases and accordingly the value in the float chamber rises to a lighter lovel, the aerometer itself consequences being influenced devices and the superimposition of the superimposition of the superimposition of the lover, where a countriveleght remains usalitered As the steel year of the flower, where a countriveleght remains usalitered As the steel of the superimposition of the lover, where a countriveleght remains usalitered As the steel of the superimposition of the lover, where a countriveleght remains usalitered to the min lever D and the superimposition of the lover in the superimposition of the lover in the superimposition of the balance on the main lever of the balance on the main lever through the increased displacement.

The vital part of the invention liss in the acrometer Alteration of trim or inclination at the vessel cannot by any means appeal the ac curacy of the instrument it is in short an absolute gape of the vessel said subjected right aft or forward it.

if placed near the center of the vessel, since the draught directly under the instrument is the mean of that fore and aft. The whole of the parts of the apparatus are standardized with the exception of the arometer, which must be proserly designed and carrfully adjusted, its form being made to correspond with that of the ship.

fully adjusted, us to the support with that of the support with that of the support with the support s



Recording instrument of the perhydrometer.

any type of craft with count facility and infallibility to a small lighter as easily as to a transatisation in the At the present unouncu arrangements are being made for its installation upon a 10 000-ion vessel in this case the diameter of the float will be about 9 inches For a small lighter it averages about 3%, inches diameter it the top by about 2%, inches at the lower activatily 80 sensitive in the apparatus that it will

extremity. So sensitive in the apparatus una it will be seen that the capitals not bard. Thus it will be seen that the capitals of a versel always possesses a means of determining exatily the velgat he has on board. For those vessels engaged in long journay, necessitating houseling at intermed are ports, it is of far-naching importance, since it canable the espitals to secretain precisely how much tuel he has abliped. This is a valuable point, inastended to the same of
The function of the invention is also curried to a further and important feature. It will inform the capitals the enter the capitals the enter weight of varier he has in his ballest its instantly communicated to the capital by the apparatus registering as increased weight or displacement due to filling with water. In cases of collision and grounding the incursion of water is similarly conveyed, the apparatus being equipped with an electric alarm boil, which conveys intrinsition for the danger to the expain No discrepancies in the residings can be introduced by variations in the density of the water the capital in the product of the capital control of the capital capital control of the capital
paratus worse. It will be seen that by the introduction of the apparatus the ship listed is practically converted into a long weigh bridge. The tailing overament similar to how weigh bridge the tailing overament similar to the accuracy of the records that its cutoms anthertic have been nedered to accept perhydrometer relings an correct. To the shipower this is no slight concession, since in regard to lidy, instead of priging 4.5 cents per ton in weighing dues, vessels fitted with the portydrometer only pay 12 Scents per ton

Influence of Phase and Rotation upon the Brightness of Huminated Spheres. The total luminosity of the moon varies according

The total luminosity of the moon varies seconding to the proportion of its lluministate hemisphere which is turned toward the earth, that is to say, in second-ance with the "phase" of the satellite Mercury and Yeuus show similar, but smaller differences of phase so little bat the variation in their brightness is havely presented by a curve As it seemed possible that step of phases can be emeasured by the astrophotomicter, and the dependence of the hrightness upon the phase can be oppressed by a curve As it seemed possible that some information in regard to the surface of the planets could be addended to the state of the planets could be addended to the state of the planets could be addended to the state of the planets could be addended to the planets of the planets could be addended to the planets of the planets could be addended to the planets of the planets could be addended to the planets of the planets could be addended to the planets of the planet

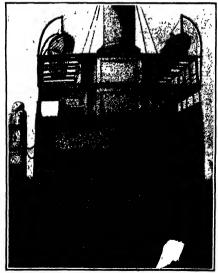
u plant was illuminated by a Nerrast lamp, not directly, but by refloction from a plane sheet of giase, through which the object could be observed in the "full" phase The lamp and the reflector were mounted on an arm which could be turned around the object in order to vary the ubase

When the results were plotted, the curves representing the planes as a function of the phases were found to fail into two claim to recommend the planes, according to the character of the material to which the globes were composed Globes of light colored material gave curves concave below, while the curves produced by globes of district materials are concave above Small elocations and depressions, glossy surfaces, etc. were found to produce comparatively fittle effect upon the curves, were found to produce comparatively fittle effect upon the curves are considered and the curves produced by the contract of the surface. The curves produced by the surface of the surface of the curves produced by the contract of the curves produced by the contract of the curves produced by the curves produced of the curves produced by t

the character of which was, in genneral, decided amore statively by the lightness or darkness of the surley of the survenus and the moon are concave above. Hence it appears probable that the surfaces of these two planets are formed of dark colored material—Perusethens.

In a recent tense of Nature the difficulty respectively.

In a recent tense of Nature the difficulty respectively as the surtices in keeping small accumulators in working order is referred to, and it is pointed out that this is probably due to the fealls being filled with dilute acid of desafty or the surface of the surface where the temperature is 15 deg. to 30 deg. Cust., corresponding to a 30 per count mixture, it is too sign for a loct climate, where it really represents a 35 per ceat when the surface of the surface of the surface of the surface and the surface of the surface of the surface of the surface and the surface of the surface of the surface of the surface and the surface of the surface and the surface of the surface and the surface of t



Sectional drawing of vessel, abowing perhydrometer.
THE PORKUDDURITER—AN APPARATUS FOR WEISEING SHIP GARGOES.

Scientific American

THE REW MITTEL PROTOGRAPHIC MELICULARY.

Besquer, in order to measure the luminosity of the subs's disk, allowed a beam of sunight to enter a dark rooss through a small aparture, behind which a converging less was placed. The divarying once of rays, beyond the focus of the less, was intercepted by a cream, forming a circle, the brightness of which was not too great to be measured to be the sam was assumed to bear the same ratio to think any was assumed to bear the same ratio to think any was assumed to bear the same ratio to think any the same ratio to the same was assumed to bear the same ratio to think any the same ratio to the same ratio that the same ratio to the same ratio that the same ratio to the same ratio of the same ratio of the object gians. Finest and Foucanit received the image of the sum on an induced plate of aliver. In successive experiments they varied received the image of the run of an include place of silver. In successive experiments they varied the aperture of the objective and regulated the duration of the exposure so that the final tint assumed by the plate and, therefore, the quantity

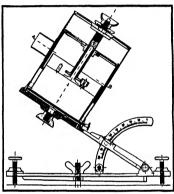
assumed by the plate and, therefore, the quantity of silver folded excomposed, was the same in each case. In this way they proved that the required integrated inversely in proportion to the aperture of the objective. In other words, the total chemical effect was found to be (within the range of expoure) proportional to the total quantity of light received by the image for the provided by the image for the provided by the total quantity of light received by the image during the exposure. Thus, by comparing the image of the sun with that of a circular area, of the same apparent diameter, of the positive carbon of an electric layst, they proved that the chamical diameter, of the positive carpon or an elec-tric lamp, they proved that the chemical effect is proportional to the brightness of the source of light. This relation, how-ever, did not appear to extend indantiely, for the quantity of silvar reduced, which

ever, did not appear to axtend indanististy, for the quantity of silvar reduced, which was at first proportional to the length of the exposure, bended toward a fixed limit in 1811 the great advance which had been made in photography cashled fansess to employ very sensitive plates, in which the total chemical effect remained preportional to the duration of exposure within very wide limits Jordan devised remained preportional to the duration of exposure within very wide limits Jordan devised crystaffers but containing a sheet of ferrogram of the containing a sheet of ferrographs action of the solar rays. Campbell, on the other hand, made one of the heating affect of the solar rays for the purpose of measuring the effective absent terms of the containing which the sun is not valied by clouds, a quantity which plays as important part in the processes of vegetation. Campbell's heliograph consists of a sphere of fishs, mounted on a horizontal

tation. Campions belonging consists of a sphere of gitas, mounted on a horisontal base, in a place exposed on every side, so that the sum is visible from its rising until its setting. A groove in the spherical mounting allows the intro-



THE RIFFEL PROTOGRAPHIC HELIOGRAPH.



VERTICAL SECTION OF THE RIFFEL WELLOGRAPH.

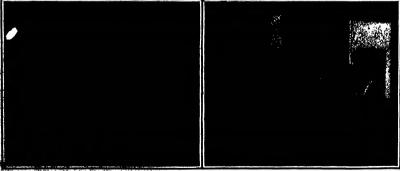
duction of a strip of cardboard, which forms a circular are at such a distance from the spherical glass ions that the image of the sun, formed by tha lens, is always on the strip The cardboard is carbonised by the concentrated solar rays at the spot where the image is formed and, owing to apparent diurnal the image is formed and, owing to apparent currian motion of the sun a black line is traced on the card if the sun shines all day without intermission this line is continuous but if the solar rays are intercepted by fleeting clouds the trace consists of a number of separate portions the post tions and longths of which show when and how long the sun has shone. The apparatus is easily set up It is necessary only to level the base, to place the noon line, marked XII on the card opporsite a fixed mark on the frame and to set the in strument so that the sun's image falls exactly on this line at the instant of true noon. In the im-proved form of the instrument designed by Stokes the frame has three grooves, at different heights, in which three sorts of cards are placed. The shortest cards are placed in the highest groove and are used between November 5th and February 5th, the longest cards are placed in the lowest groove the longest cards are placed in the lowest groove and are need between May 5th and August 5th, while the cards of intermediate length are placed in the middle groove and are used during the remainder of the year

Eiffel has recently invented a photographic re-cording heliograph which has been used for some time at the central meteorological bureau of France timo at the central meteorological bureau of France and at the Juvlay observatory Ir consists of a cylinder which is mounted on a shaft parallel to the earth's axis, and is turned by clockwork at the rate of one revolution

by clockwork at the rate of one revolution in twenty four hours. The sun's rays en tor the cylinder through an aperature in its convex surface which is surrounded by a hood for the exclusion of diffused light An inner cylinder, covered with photo-graphic paper, is supported by a nut which can move along the shaft of the outer cylinder which shaft he are a serew thread A guide, attached to the case of the clock work, prevents the inner cylinder from rotating Hence as the outer cylinder turns, the inner cylinder is compelled, by turns, the inner (yilinder is computed, by the screw, nut and guide to more along the shaft wilhout rotating The photo-graphic paper is surrounded by a screen, which has various degrees of transpar ency in its various parts correspo the average intensity of sunlight at differ out hours and seasons. As the outer cylin der rotates, its aperture is always directed ximalely to ard the sun and lu con sequence of the motions of the two cylin ders, the eniering pencil of light traces a helicordal line on the paper which is wide enough to serve for a number of days. No now conclusions (an be drawn from the photographic records made by the Eiffel heilograph until after the instrument has been in continuous operation for several

CARDIN PROCESS OF PROTO-SCULPTURE.

The idea of employing photography as an aid to sculpture soon followed the in vention of the daguerreotype Fifty years ago Will dovised a process in which the sculptor's model photographed simultaneously by twenty four



o from the front, back,

Fig. 1,-Cardin's apparatus for modeling from four photographs.

Scientific American

cameras, arranged in a semicircia. A paper positive h made from each of the negatives and the twenty-four prints are cut out along the outlins of the figure, and are then cut in two vortically. The forty-sight HALLEY'S COMET IN THE STREETS SET. by manny notion notices, rate.

The average man will find by far his best opposite the state of
The average man will find by far his best opportunity to see the consult, which has occupied so prominent a place in public attention, during the last ten, days of May The accompanying map above at a giance just was seen the circumstance of its appearance. A find that the companying the com

million on the list, so that it will appear to shrink and grow vistby father from night to night. In addition to the stars mear the coinsit' path, and the place of the compt for each night (at 10 P M Eastern Standard Time, gr 2 P M Central Standard Time, etc.), the map shows the position of the hori-son among the stars at certain hories, so that it is easy to estimate how high pay they will appear at

any time. The given position of the horison is exact for ob-servers in latitude 40 deg north (Pennsylvania, Ohio, Illinois, Utah, northern California).

Those south of this line will see the stars on the right (on the mag or in the sky) somewhat lower, and those on the left morsewhat higher, at the same hour In any case it will be sky to identify them hy thaty their relative positions.

Those unfamiliar with the constellations may w

Those unfamiliar with the consequencing may went begin with the four brightest stars Reguins (at the end of the sickle-shaped group shown on the map), Castor and Poliux (close together), and Procyon

MAY 14, 1960.

bile of Wight alternately mores forward and busk-ward with the variables of the fides, the presidence was with the variables of the fides, the presidence are of the water in kight their the presidence of the real as compared with that in the fidest and fight-heat causing life island to be titled suwered hodify from the clauses side. His alternation have been carried out in connection with the Irish flees at the mouth of the Sterey. A special type of seismite re-ourder has been devised and has been set up in an underground position at Historic Observatory near Liverpoot, some two miles from the water's edgs. The surface of the professor's cardiquake record-ers, the boom being free, so that as the mast moves and the surface of the professor's cardiquake record-ers, the boom being free, so that as the mast moves A photographic recorder is connected to the appara-A photographic recorder is connected to the appara-tus on as to secure a permanent visual record of the oscillations. The instrument is far more sensitive than that samplered for ordinary seisme operations, thereby indicating those very alight movements of the sent's which the ordinary apparatus would tignore. The records accured by this instrument conclusively prove that twice every twenty-four horrs the opposite sides of the titus least are drawn closer together, the

omens occurring at high tide when the incr paesoness occurring at high tide when the increases, volume and weight of water piled up in the Irich Sea and pressing on its bed occuses the latter to sag som-what. The action can be watched, for when the tide is flowing quickly and the tide is high the pendulum moves a considerable distance and keeps pace with the defection due to the increasing load. At Bliston

deflection due to the increasing load. At Mistern weight of the state of the mount of the Merray cames a deflection of about one inch in a distance of sixteen miles. As the tide abbe and the weight is reduced the ang diminishables like a dent in an India rubber be ball, and the banks on either side alony recode from one and the state of the the instrument were the ed nearer the sea, and Prof. placed nearer the sea, and Prof. Milne points out that for this rea-son observatories should not be situated too near tidewater. The regular alternate movements of the apparatus in opposite direc-tions every six hours not only, as it were, record the extent of the it were, record the extent of the elasticity of the earth's crust, dem-onstrating that it is responsive to pulls and strain to a far greater degree than is generally be-lieved, but also weigh the tide it-self. The result of these expertseir The result of these experi-ments should provide a new field for investigating tidal forces and phenomena, and possibly contrib-ute to our knowledge thereof.

The Current Supplement.
Almost the entire issue of the current Suprimerat, No. 1783, is devoted to a complete description of what is known as the New

m cervose to a complete description of what is known as the Pennsylvania Raliread, the contile the Inverse as the version of the Landson of the Pennsylvania Raliread, the contilect improvement ever made by a raliread, and one of the most increment ever made by a raliread, and one of the most increment any published, showing the excentions which the properties of the control of the complete distinct. Dr. Olio Hofmann writes interestingly on the system of the universe. Carbon telescholed possesses in comparison with carbon distribution of the control of the carbon telescope in comparison with carbon distribution of the carbon the damper of fire and the cout of insurance. Hence it is used frequently as a harmines substitute of homes and genotine in elementary clother. An article on the embed appears in the Structurery. Menty & Wiele Structurery and the Structurery is concluded.

Recently Mr. W. Casmer, of Leeds, read a paper before the Rotherham Sendenering Stockey on "Rang-mering in the Rollier Rouse." Mr. Onteney "Rang-mering in the Rollier Rouse." Mr. Onteney evil-tate was an indication that the incotory children re would be rappiated by mechanical fasting on the as 150 cost of melintaling stoom by seek neck-cles see that the stocking gapes und water in-tention and lange belon in use obtainers and on meni-derities and lange belon in use obtainers and on meni-derities and lange belon in the solutions and no meni-derities and lange belon in the continuers of the combraction. A full continuers in the continuers of the variety bear invested for this purpose, summitting a gape accussed by the draft of the changes and several generation of the second of the continuers of the page accussed by the draft of the changes and several generation of the present of the langes of the second lurround to the spenier love of greats, pier loyer.

profiles thus obtained are assembled radially about a verikal axis in their proper relative positions. By filling in the intervals with a plastic mass a fairly silling in the interests with a plastic mass a fairly complete skeled of the figure is obtained. This process may be raticle as follows: A mass of day or modeling was is placed on a rewiring circumpara-plations, the circumference of which is divined into teastry four complete arts. The approximant form of the model having feen given to the mass by the usual methods, the outside of the figure in one of the fentire) photographs is followed with the tracking point of a pantograph, which is so constru

joint of a paniograph, which is so constructed and arranged that its colying point plows a furrow in the mass of tay. The platform is then thread through one division and a second furrow is made from the sevend photograph. This process is repeated with each of the twenty four photographs, and the clay between the furrows is carefully removed. A very sailfully hand in required to perform this operation so as to reproduce were deadly of the model, but the object of this and all other processed of photographic and the second of the control of

camera, before a triple mirror, by means of which the

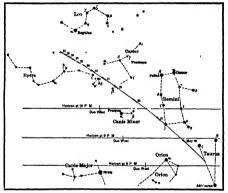
tion As the sitter's face and the three virtual images formed by the mirrors are unequally dis-tant from the lens, the four imtant from the iens, the four in-ages formed by the latter are not in sharp focus in the same plane For this reason the ground glass focusing screen is made in four sections, and the plate holder is contrived to hold four plates, side contrived to hold four plates, side hy side, but in nlightly different planes. The same cause produces differences in the scales of the four photographs, but in making the enlarged copies which are emin the operation of model ing, these differences are easily removed with the aid of the plummets which are suspended above and at each side of the sitters head, and which appear in each photograph and indicate

The modeling apparatus is shown in Fig 1 A vertical post rises from the center of the rises from the center of the square iron platform 8. Two photographs, a front view T and a profile B are supported in a vertical position by frames which slide in guides bordering two ad jacent sides of the table These sides are furnished with jointed

sices are furnished with jointed supports with carry long rods.

A and B The rods can slide TRACE lengthwise in their supports and can be inclined and mored vertically and horizontally by means of the joints of the supports. The rods are ny means or the joints of the supports. The rods are used horkontally if the buss is to have the same scale as the photographs, and are inclined for en largements and reductions. The movement of the photograph frames in the guides is limited by fixed atops, so that the frames can be removed and replaced exactly in their former positions The rods and their supports are adjusted to bring

The roos and their supports are adjusted to oring the inner and of the rod A into contact with a con-spiration point, the tip of the nose, for example, in the full face photograph T and the inner end of B into contact with the corresponding point of the profile E The frames containing the photographs are then removed and the rods A and B are pushed inward in their supports until their inner ends meet. The point of meeting determines the position of the top of the nose of the hust. The post at the center of the table is covered with clay or other plastic material, which is built out until this point is established in tangible form The rods are then drawn back, the photographs replaced and a second point of the face in established replaced and a second point of the race is eccasionses by a repetition of the process. In this way numerous points distributed over every part of the bust are fixed, each pair of adjacent eldes of the table, and the corresponding pair of photographs, being employed, as required. The result is an aimost complete sketch, ed from a sitting of a few seconds. All of the operations can be performed by a skilled workman The hand of the sculptor le called into requisition only to give a few finishing touches in another bris sitting, and to impress as individual artistic cha acter upon the work.



TRACK OF MALLEY'S COMET AND MEIGHBORING STARS, MAY 90-81, 1910

(lower down, between these and Regulus). With these as guides, the other stars can readily be picked out, and the comet identified

and the count identified

From present indications it is probable that at first
(on the 30th and 31st) the comet will be as hright
(an thee bright stars and viables at a giance. Toward
the end of the month it will be much fainter, but probably still easily visible to the naked eya.

The tail will extend upward and to the left, practi-

The tail will extend upward and to the left, practically along the line of the comet's apparent path. How long it will be it is even yet impossible to say A fract the light of the moon (which is full on the night of the 25rd) will drown out the fablar parts of the tail, but laker, when it is out of the way, these may privace be seen, though the comet will be no such farther not flat, on the whole, it will hardly be so fine a sight,

In observing it telesconically the ave est power, giving the largest field of view, will be most milisfe

sten University Observatory

The Electicity of the Earth.

The Einstein of the March.

Bone interesting experiments have resently been carried out by Prof Miles, F.R.S., the well-known authority on sainmology, to demonstrate the visaticity of the earth especially under the influence of the tides.

Some years ago he showed that valleys during the day are of greater with than at night, there being an expansion or opening out under the action of the sun and a contraction or closing up in the hours of darkness. He also showed by means of seismographic records secured at his observatory at Shide, that the

Wireless Telegraph Apparatus for Contestants of the Glidden Tour

BY RENÉ HOMER

In the district selected for the annual Glidden tour this year, ordinary telegraph communication will be very difficult, and at times impossible. In 1995, a though the thur passed through a comparatively wellthough the tour passed through a comparatively well-settled country, the wherehouts of several of the con-testants were often unknown for hours. One car, for instance, failed to report at the night control, and no nee knew what had happened until the naxt morating that had happened until the next morning commion a passenger was injured in an



mboo serial set up in our.

accident, and nothing was known of the matter until it was reported by a belated tourist at the night check ing in Many minor difficulties were responsible for considerable delay that could have been prevented if the cars had been in communication with the last

The Chaimers-Detroit Company propose to keep in The Chaimers-Detroit Company propose to seep in touch with the contestants by means of wireless toleg raphy Complete plane have not been worked out yet, but it seems probable that some such acheme as the use of three field wireless stations will be favored, two of of three field wireless stations will be favored, two of them being in touch with the wire system, while the hilled in touch with the wire system, while the hill station is being established at some advantageous that sheed of the contestants. The exact details of the plan will be furnished after a trial can be had at chance to go over the worst portions of the proposed route. In the early part of March successful wireless telegraph tests were made for the Chalmere-Detroil Company between one of its cars in Central Park, New party between one of its cars in Central Park, New and 47nd Street. Thus the Detroil of the Park Aronse concludit to these miles to the trial from a northest section.

one-half to three miles in the trial from a moving car, whila the experiments with the portable field stations showed that this type of apparatus at least would be able to carry on certain communication up to fifty miles, as the field station was able to keep in com-nunication without any trouble with the Metropolitan and Manhattan Life towers and another wireless station at Newark, N J Later, communication was maintained between a car on the New Jorsey highways near Trenton to the "sparkless" wireless at

tion on the Land Title Building at Philadelphia, nearly thirty miles sway.

The receiving station for running automobiles comprised a 7 foot serial in connection, through a loose coupling, with a variable and a fixed condenser, a detector of the aution type, telephone receivers, and a bigh and low voltage bettery The sending set comprised two storage cells, a 10-lach spark coll, two Layden jars, and a "ly-jinch "radiction discharger" similar to those used at the Micropolitan and Mandillar the state of the s

hattan Life stations. This apparatus, which worked acconsentity up to three miles, the furthest distance tried, would sprobably operate for several miles far more than the control was soomed by drawing between the rear wheels a heprical tabling frame supported on middle space being occupied by three Schoel steel wheels with silks bearings arranged so as to allow the weight of the wheels to keep them in contact at all times with the read On the macedamized roads of the park this system of grounding worked fairly well, although on like sandy roads of Now Jersey, where the subsequent tests were made, a great deal of difficulty was experienced in properly maintaining the ground the same properly maintaining the ground the subsequent tests were made, a great deal of difficulty was experienced in properly maintaining the ground the subsequent tests were made, a great deal of difficulty was experienced in properly maintaining the ground the ground the ground the deals with the ground the gro

ran only about ton miles an hour Field stailons which can be put up in five minutes can be operated more successfully and the same appa-ratus used in the automobile by stopping the machine and securing proper ground has a range of about ten miles. The sending circuit of the field stations used in the longer distance tests was the same as that of the moving stations with the exception that three storage ceils instead of two were used, and another 10-inch spark coli was connected in parallel with the first coll, so as to be operated from the same key

first coil, so as to be operated from the same key This gave a range of about fifty miles

The field sending station was provided with a 100-to serial second at one end to a spreader statehod to a 48-foot hamboo tolescope must and heading down diagonally to the top or a 12-foot must about 90 feet away and thence back to the sireless apparatus about midway between the two poles.

Two of the photographs about the first successful coil, in which a 35-foot serial and a 5-foot head of the total coil sectuated by one strong coil are tased. With this coil sectuated by one strong coil are tased. With this behalf with the higherstory of 400 first first-about one head of the total coil are tased by the strong coil are tased.

be held with the laboratory at 42nd Street, about one

be held with the laboratory at 22nd Street, about one and one-half to two miles away In the more recent tests additional condensers star age cells, and audion receiving accessories were used The closer view shows a radion detector in use (to) of the box to left) while a perikon detector is shown nuccied on the table in front of the other appara.

The box upon which the operator is sitting con-

tains the interrupter, spark coil, and discharger, which are inclosed on account of their delicate nature and because they have not yet been protected by patent in the newer station all this apparatus is carried in the antomobile, and there is no necessity for setting up the apparatus on the ground although the scap box does indeed make an admirable table for a wire-

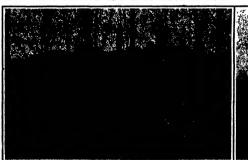
ss station In the coming tour it is proposed to send two scout



Automobile wireless equipment,

cars ahead of the regular contestants, each one of which will carry the complete field set of oven greater range than that which every car can carry Point where the telegraphic facilities are poor or impossible where the telegraphic facilities are poor or impossibles will be picked out and the two cars will arrange to be at stations at these points just abend of the pitch car one station being equipped for business while the other is taking care of the telegraphic business of the tour In this way one of the two field stations will be in operation all the time, while the other is being set up at the next point along the route

sirous as the floods in France have proved for Disastrous as the finode in France have proved for the railways, a worm disaster occurred one day last winter in America. Three days previously a warm wind arose in the State of Newside so suddenly as to neit all the snow. The result was such a torrent as to entirely was away 100 miles of the San Pedro. Los Angeles and Sast: Lake line south of Calleate The routs of this line was known to be rather liable to this, but was chosen as it saved much distance doos after its construction it was undermined by a storm, which still over \$50.000 damage to it. The explaner of the control of the substitute of the control of the line of the storm of the control of the control of the line flow after if income and most creativ rouse. Which lo find a safer if longer and most costly route. Which ever route be chosen, it will be from six months to a year before the line can be built and the cost will. is said, be from ten to fifteen million deliars

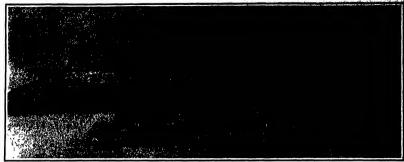




The successible equipment with the abrust and wireless apparatus.

to miner wireless messages from an enterpoble.





The practical success achieved with the gasotine-properied motor sieigns out the Shacktein and Charcol point regulations has prompted Cast Section to cluster a vehicle of this type for his forthrorning datably to the south point. This weblie, is, however, distinctly different from the motor sieighs filtherly used in the two previous cases the trust of the cast mounted on runners or skates, a chain and sprocket. mounted on runners or skates, a chain and sprocket with spuds which pripped the snow and fee being fit-ted at the position occupied by the wheels in the ord lary motor car. In the now sleigh, however, what may be termed an adaptation of the pedrati or cater pillar system has been resorted to, which imparts a greater dogree of efficiency to the vehicle, and onables

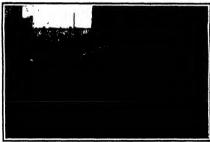
it to surmount obstacles and to travel over rough ice

it to surmount obsaseles and to travel over rough leads and sone with seas in view of the conditions prevailing and the work it is intended to risili in the south point regions, the eighte is of a special type it comprises four varietal cylinders, cast in pairs, and developing twelve brake horse-power

The steigh is fitted with a runner, upon which bear the rollers of the chala. The latter passing between this runner and the ground supports the whole while the condition of the chala. The latter passing between the runner and the ground supports the whole while the steight is at the whole previous. There are not not not not approximately in the condition of the

area such as an ice Sald steering is not demanded When it is required to deviate to the right or left that function. Turning sharp, corean, under these circumstances, is admittedly exceedingly difficult, but when working in its designed sphere this drawback will not be serious, as sharp turning can be gener-ally worlded.

aily avoided. The sleigh has a substantial wooden frame, and un-derneath is fitted a large undershield artending from and to end so as to present a perfectly smeeth sur-face to the snow When the aleigh is under way a curious fact is observable. The chain, where it (Oncolused on page 407.)





Pedrall motor sled which Capt. Scott will use on his forthcoming antarctic expedition.

Capt. Scott's traction sled undergoing its tests in Norway.



A Swedish motor traction gled with a maximum speed of 36 miles on hour.

THE FLIGHT FROM LONDON TO MANCHESTER

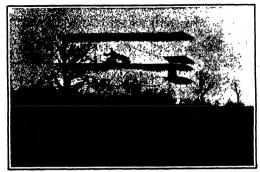
THE AVIATORS' OWN ACCOUNTS

Both White and Paulhan have furnished the London thairy Mail with accounts of their remarkable sights. White rose at 2.00 A. M. Twenty-four minutes later be was in the darf it was no dark that people were proping about with lenteras. "As a stood by the side of my acropiant," White states, "there was utter blackmess facing me, faintly relieved in the destance by two or three twinking states, "there was utter blackmess facing me, faintly relieved to the destance by two or three twinking the state of the state and I rose once more.

"oreat difficulty presented itself in knowing in the darkness whether I was ascending or not, I had done no night dripp before, but I soon became accustomed to watching closely the movements of my sievating plane, which was silhouetted before me against the sky

"I steered on for a spell with nothing at all to guide me After leaving the lights of Roade behind, the gleem from an occasional signal box far below helped me, however, and so I picked my way through the night to Bilaworth

"Here I felt enror of my ground and hore away to



Grahama White leaving Rugby.

flow off till I was over the train I saw the lights of Rugby, flow over the town, and forged ahead "Daylight began to come new, and from here on to the point of my descent in a field near Polesworth my structie was not with the darkness, but with the wind

Not a moment s rest came to me in my battle against

"Giance at my alilitude chart and you will see that I made rises and dips of as much as 320 feet always with the object of flying in the steadlest level of air I could find
"After the start I was going north for a long time

"After the start I was going forth for a long time-before I sighted the special train with was accom-panying me, but there was no mistaking it when it caught me up, with three loud toots of the whistle and a big white signal (loth flowing from the window of the rear coach
"it looked like a handkerchief from such a height

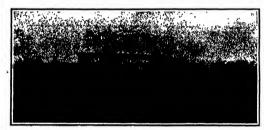
but it told me all i could see that things were going well. The wind whistled and so did i

"I flow until it was quite dark Ali I could make out beneath me was the smoke of the train once in a white and the occasional flicker of lights from a

"I came down rapidly from 300 meters to 100, so that I could be more certain or my direction Then came the most exciting moment of my direction Then came the most exciting moment of my flight Darkness had failed and before me I saw the lights of idehdeld I decided to alight in some conveniont measure before reaching the town and to do this I sank down to 180 feet. I was immediately above what looked like a largo factory with a chimney I am now told it was a brevery. And so, to alight asfety in a field with no damage done, I made a fishbook ture, and my machino was now pointing toward London

"Buddenly my motor storped Every drop of petrol had been exi austed and the machine swooped down

ward almost like a stone dropping



White's scropiane after landing.

the left for Weedon Faint lights shows here and there Some, no doubt, were cottage windows and others, I think, were the head lights of motor-cars. I passed over Weedon, my area becoming more accustomed to the darkness.

passed over Weston, my syst becoming more accurated to the darkness.

"On I few The wefriness of the sensation can scarcely be described I was alone in the darkness, with the car of my engine in my says. As I glanced best small bright fishes or light, the discharge of the state
behind.
"I deviated a little from my course and headed for this patch of light. I saw the motor car moving as I, approached, with its headlights throwing a great path of light down the readway I; set off at a head-neck pace, its driver evidently meaning to guide me

neck pade, the currer virtuals are considered to the pade of the pade of the pade of the the pade of the the pade of the pade

"This, I thought, will be a splendid guide, and so I sweep ever from the lights of the meter our and

It was the fierce guats which eventually brought me down.

Paulhan, too, seems to have been troubled by the winds, for he boars out White's account. He writes
"I had to fight the wind all the way from London.



Recharging the guardine tank of White's machine. THE PLICKY PROM LONDON TO MANGEMENT.

and a certain smash, behind me was a narrow field, which was almost like a spider's web with its mesh of lelegraph wires

"I had an imperceptible fraction of a second in which to make up my mind, and I decided to risk water to make up my mind, and I decided to risk the telegraph wires. As I sank I made a sharp twist right back on the line of my course, and was lucky enough to lift mysoff over the wires. "I went to hed at I o'clork deciding to start again as soon as it was light or even a little earlier. I slept like a top for five hours.

ilke a top for five hours

"It was still dank when I reached the narrow
meadow besid: the Trnt Valley station in which my
machine was 13 ing My mechanics had worked well
during the night. The machine was charged with
ptrol and she was all ready for the start.

Happily, favored with the headwind I was then facing though it was a following wind for my flight, I rose without difficulty, turned, and headed straight

TOT MERCHESTER
"Here was the end of my concern about the issue of
the race Barring accidents, I was bound now to reach
Manchester in safety and in good time, and there was
no reason to anticipate accident, for I had aurmounted the worst of the difficulties—that of a rise from a narrow field only 120 yards long above dim fanterns which were my only indications as to the whereabouts the hedge.
"As soon as I got up I made a circle, followed the

railway, and then set off for Crewe, fighting all the way against gusts of wind So certain did I feel of the road that I did not trouble to take my man on the

rection, northwest, total movement, 9,169 miles; averrection, northwest, total movement, 5,169 miles; average honrly volcity, 187, maximum velocity, 44 miles per hour Weather. Clear days, 7, partly cloudy, 18; cloudy, 10, on which 001 or more of precipitation cooured, 11 Mean relative humidity, 611 Dense for. 4th and 18th. Thunderstorms, 6th and 25th. Light, 14th, heavy, 18th

COMPLETION OF THE PERMITURANTA RATIDOAD TURNELS AND TERMINAL STATION.

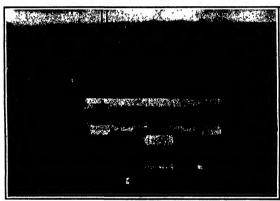
As late as the year 1901 the Pennsylvania Railroad was employing ferries to land its passengers in New York city just as it did in 1871, when it first leased the United Railroads of New Jersey Ten years ago the United Railreads of New Jersey Ten years ago the system was hauling freight to Eastern cities over practically the same heavy grades as were to be en-countered in 1875 To-day the company is completing a monumental improvement in and around New York a monumental improvement in an around wew tora city which will enable passengers to travel from east ern, western and Long Island points direct into Man-hattan Ieland, arriving at a railroad etation which, for convenience and for the beauty and dignity of its architectural appearance, probably outranks any similar building in existence.

air building in extence.

During the past ten years the company has epent an enormous sum of money in straightening out its time to the East, and in cutting down grades, and in a few months' time freight trains which are already a few months' time freignt trains which are airoady traveling over the new lines, on which they encoun tor no grades greater than tweive feet to the mile, will be run direct to large terminal wharves on the New Jersey above of upper New York Bay, and for

the original struct surface, extend from Tenth Armine to Serenth Armine, From Tenth to Nitet Armine to Serenth Armine, From Tenth to Nitet Armine the yard congress encer than the area of a city block, and from Ninth Armine to Serenth Armen the hope contraction correst the whole width between Thirty-first and Thirty-third Structs. The extension correst theoretics over the other largest city blocks, and it involved the removal of over \$0.000,000 colib rarks of materials. Proceeding easterly from the terminal yard, material. Proceeding earlerly from the terminal yard, the tracks, four in number, are carried below Thirty-second and Thirty-third Streets to the East River, under which they pass in four separate these. The grade descending to the river is 1.5 per cent, and the sacending grades to Long Island are 0.7 and 1.23 per

cent.
The new terminal station located between Thirty-first and Thirty third Streets, and Seventh and Eighth Avenues, is a truly magnificent structure, built of grainite on classical lines The terminal work was carried out under Mr George Gibbs as chief en ried out under Nr. George Gibbs as chief engineer, to whom we are included for contrasted outring the pre-paration of the present article. The main entrance to the station, on Seventh Avenue, leads through an ar-cade forty-dwe feet wide by two hundred and twenty-fer feet long, to the main wetting room, which, with its width or 108 feet and length of 177 feet, and clear height of 150 feet, ranks as the largest in the world. Just what these dimensions mount is shown by our front page engraving, which portraye the central por-tion of the New York City Hall with its tower, standing on the floor of the waiting room, with the top of its flag pole failing to reach the roof by fully ten feet.





The crowd on Wormwood Serubin awaiting White's start.

Paulhan in full flight.

second stage of the journey This was a mistake, for after leaving Crews I thought the first station marked my landing jaise, but I could discover some of the wind the state of the state o

was to land

was to land
"I landed and I knew I had won All the way from
London it had been a fight between me and a puzzling
wind, and I had beaten the wind"

Official Meteorological Summary, New York, N. Y., April, 1910.

April, 1910.

Atmospheric pressure Highest, 20 28, lowest, 29 57, mean, 29 93 Temporature Highest, 79, date, 30th, lowest 34, date 8th, mean of warmest day, 64, date, 8th, coolest day, 41, date, 8th; mean of maximum for 6th, coolest day, 41, date, 8th; mean of maximum for the month, 621, mean of minimum, 488, absolute mean, 440, normal 481, daily access compared with the mean of 40, person, 50 Wernster mean temperature of April, 14 in 1971 and 1916, codest mean 41, in 1574 Absolute maximum and minimum of April for 40 years, 80 and 52 Average daily excess since Janu-1974 (1988) and 1981, presents in 34 hours, 223, dates, 815 and 5216, presents in 34 hours, 223, dates, 815 and 5216, present in 34 hours, cross since January 18, 014, Graft of Averunitated Cross since January 18, 014, Graft of Averunitated Cross since January 18, 014, Graft of Averunitated excess since January 1st, 014 Greatest precipitation, 7 02 1874, least, 1 00, in 1881 Wind Prevailing di-

ried across to Bay Ridge, Long Island. The company is about to construct a four-track arch bridge across the East River near Field Gate, and when this is completed frains will be run through Long Island from Lang Hidge to Fort Morris, where connections will be made with the New York, New Haven and Eartford Railroad Passengers from the Bouth, Botthweet, and West, over the Pennsylvania Railroad system, by using the North River and East River tunnels and the using the North River and East River tunnels and the Hell Gate bridge, will be enabled to travel without change of care between New England and the West which will have cost in the aggregate, including the revision of the western line, over \$16,000,000, were conseived mainly during the administration of the late A. J. Cassett, former president of the company Commencing at the western and of the New York

THE PLICET FROM LONDOR TO MANCHESTER,

commencing at the western end of the New York tunnel system, we find at Harrison, New Yersey, a large terminal and transfer station, where passenger trains from the Bonth and West drop their steam leo-motives, and the electric locomotives, which haut them into New York city, are coupled on. The tracks run into New York city, are coupled on. The tracks run on a high enhankment across the Hackensack mesdows to Bergen Hill, where they enter the western prottil of the twin insuels. Two deceased on a grade prottil of the twin insuels. Two deceased on a grade run in the prottil of the twin insuels and the tracked about conclude of the Hacken Run in the large prottil of the Hacken Run in the large prottil of the Hacken Run in the large prottil of the Hacken Run in t Opening out from this room are two smaller withing rooms, each 88 by 100 feet, which are provided with che ward retrifier rooms. On the same level also is the main hagages room, 450 feet in longth The bage-cial subway, the trunks, etc., being delivered to the main hagages room, 450 feet in longth The bage-cial subway, the trunks, etc., being delivered to the track below by motor trucks and elevation. "Passing through the main writing room, the traveler will find himself on a vast concourse 101 feet wide, which set himself to a vast concourse 101 feet wide, which with the large waiting some the truck the parallel with the large waiting to the truck the lead down to the trulk platforms on the truck level below, which is forty feet below the street surface lead down to the trulk platforms on the truck level below, which is forty feet below the street surface and the trucks is a sufficiency, and the concourse and the trucks is a sufficiency of the surface
origoing passengers only

The Thirty-third Street side of the scation will be
evoted to the Long Island Ratirond service. It will
e provided with its own entrances and exits, and the
raffic will be handled independently of the western be provide

traffic.

In the design of the exterior of the station, the
architects, McKin, Mand & White, endeavowd to
architects, McKin, Mand & White, endeavowd to
give to the behinding the character of a meyemmental
estrance to the occurrence of the construction
which would at the same time construct to the traditional support of a great railway terminans. Also the
station was designed to give as free a drepolation as
possible for the many millions that will nameably peak
for the many millions that will nameably appear
the contract of the such facebook on fewerals Archive is
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composed of a Rennes Dorle colonande, with columns fear next six inohes in diameter and thirty-dwe next high. Allowing for its much greater scale, the main spirance is comparable to the Brandenburg gate in Berlin. The pain body of the building is shout the same height as the Bourse of Faris, reaching, as It-main estrance on Thirty-second Street is at the con-rect of this façodo, and at each corner is a stiry-dree-fored that scale, and at each corner is a stiry-dree-fored that scale, and at each other in the scale of the scale of the scale of the scale of the colonal original scale of the scale of the scale of the columns and entrances to that on Seventh Avens. The passenger station building, which is 17 set long by 450 feet wide, covers some eight acres of ground, and the construction of the enterior walls, which are nearly half a mile to langth, required nearly half a million onthe yards of plack granits. This and

which are nearly half a mile to length, required nearly half a million cubb parks of pike results. This and other stone work to the building ran up to a total of \$7,000 cass, and to transport it from Millord, Mass, called for the service of 1,140 freights care. Into the construction of the huilding there has also en-tered \$7,000 cass of steel and 45,000 cass of brick The statistics of dimensions and quantities of ma-rity and the state of the state of the state of large from among those supplied by the railway con-lang from among those supplied by the railway con-

Area (10th Avenue to normal tunnel			
· section east of 7th Avenue)	28	acres	
Longth of trackage	16	miles	
Number of standing tracks at station	21		
Sumber of passenger platforms	11		
Fotal excavation required :	3,000,000	cubic	yard
Length of retaining walls	7,800	feet	
Sumber of lineal feet of streets and			
avenues carried on bridging	4 400.	. OF 81	1 870
_	of at	out 8	acres.
Concrete required for retaining walls,			
* foundations street bridging and sub-			

160,000 cubic varde

structures umber of columns supporting station ding
state weight on one column
ser of buildings removed on ternal area, about
r capacity of service power plant intal length of tunnel (2-track), Jersey to Long Island 5,000 borne n 6.8 miles

After passing under the East River the four tubes seach Sunnyaide Yard, the terminus of the Long is-and tunnel extension, which covers some 158 acres

of land It contains 73 miles of track, and has a ca-pacity of 1,550 cars. From the Sunnyside yard there are tracks leading to the New York connecting rali-road, which will form a junction with the New Haven Raliroad at Port Morris.

Railroad at Fort Morris.

An important feature of the New York tunnel extension is its relation to the Long Island Railroad, which is subsidiary to the Pennsylvania system It is estimated that forty minutes will be saved between Long island points and New York city by the opera-tion of trains through the East River tunuous to the Pennsylvania station at Thirty-third Street.

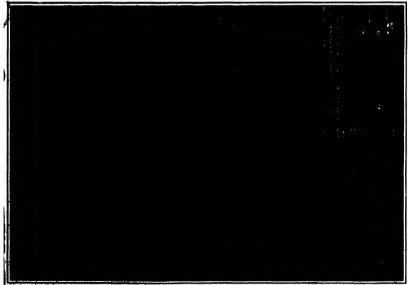
tion of trains through the East River tunes to the permaprisan's station at Thirty-third Street. Demonstrates station at Thirty-third Street. The permaprisan's station at the East rivers has been so fully described in previous issues that it will be undicated here merely to recapitulate the principal features of this work. The tabes under the Hedoon River were driven by a special shield designed by Charles M Jacoba, who is about well known as the child equitment of the four larg driven for the Hundon Company's system of rupid traustit tannels. Contract for the North River tunnals was let to the O'Rourke Engineering and Construction Company. The shields were threat forward by twenty four runn capable of exerting a pressure of 3,000 tons. At first, the silt and other material shield, latterly, however, the shields were pushed bodily through the material, and only about con-chird of it was removed through the tunnel, being admitted frequent the contract in the Trace. The cast-from liberough the down in the lower face. The cast-from liberough the down in the lower face. The cast-from liberough the down in the lower face. The cast-from liberough the down in the lower face. The cast-from liberough the down in the lower face. The cast-from liberough the down in the lower face. of it was removed through the tunnel, being admitted through the doors in its lower face. The cast-front lining of the tunnel is twenty-three feet insteined finance of the tunnel is twenty-three feet insteined damater. The insteiner is tilled with twe text of concrete making the flushed interior damater of the tunnel situation for the weight of the cast from timing, with the finance of the weight of the flushed tunnel with the heavier lining, when concreted up and equipped, is \$1,489 pounds per lineal foot. The weight of the situation for the weight of the flushed to the flushed per linear foot of tunnel, is \$1,589 pounds The weight of the tunnel with the maximum train the weight of the tunnel with the maximum train. The weight of the tunnel with the maximum ratio and the weight of the tunnel with the maximum ratio. The weight of the tunnel with the maximum ratio and the weight of the tunnel with the maximum ratio and the weight of the tunnel with the maximum ratio of the weight of the tunnel with the maximum ratio and the weight of the tunnel with the maximum ratio and the weight of the tunnel with the maximum ratio and the weight of the tunnel with the maximum ratio and the weight of the tunnel with the maximum ratio and the weight of the tunnel with the maximum ratio and the weight of the weigh

staff, the excellence of the contractors equipmen, and the harmony with which all concerned entered into the task of driving these tunnels, the work was car-ried through practically without a hitch, and consid-erably faster than the most sanguine expectations

The driving of the tunnels beneath the Rast River, which was in charge of Alfred Noble, Past President of the American Society of Civil Singheers, was done by S. Pastron & Society of Civil Singheers, was done by S. Pastron & Son, the contractors, of London Because of the great variety and difficult nature of the material through which the tubes passed, much trouble was experienced at rarious times with blowous, but utilizately those difficulties were mastered and the tobe pushed through to successful completion in addition to the many millions the Pouncylvania Railrond is spending on the four tunnels under the

Railroad is spending on the four tunnels under the East River, and the station and terminal in Manhat-East River, and the station and terminal in Manhaitan, all of which will greatly benefit long listed, the Long listed Railroad is lucrosating its own facilities and the larger traffic which will recall be larger traffic which will recall from the completion of the tunnels. The contemplated works will necessitate an expectations on the long listed system of more than thirty million deliter. The new service will include a six track the form the mouth of the read. Woodside to Winneld. Two mites at farmer, and will include a six track the form the mouth of the read with the larger traffic and the larger traffic at force that the larger traffic at force that the larger traffic at force that the larger traffic at the larger traffic at force that the larger traffic at the larger tau, all of which will greatly benefit Long Island, the

cinded within a circle of nineteen miles drawn from the City Hall in Manhattan as a ceuter, was in 1890 3,326,998, in 1900 it had increased to 4,512 153 and to 1905 it had grown to 5 404,638. It is estimated that 1905 it had grown to 5 40,433 it is estimated that by 1913 the population of this retrietory will be about 8,000,000 people, and in 1920, 8,000,000. The reliable that the ferminal on the western bank of the luddon River carried nearly 8,900.000, poople in 1886 in 1896 they carried over 1200,000, in 1886 more than 94,000,000, and in 1906 they carried about 14000,000 people The significance of these fluores was fully considered by the Pennsylvania Rallingaries and the significance of these fluores was fully considered by the Pennsylvania Rallingaries and the significance of these fluores was fully considered by the Pennsylvania Rallingaries was a supported by the Pennsylvania Rallingaries was a s



Interior view showing the conceurse and the station pintherms.

emendimentaring appled directly are mitted. The complete the member thank according to antique the about the order orders' are and handles fleat or the filled. Sub-surface station YARD OF THE PENNSYLVANIA TERMINAL, MANHATTAN ISLAND



BIBDS-EYE VIEW OF THE SUFERS STEEL AND GRANTE TERMINAL STATION OF THE PENNSYLVANIA BAILROAD ON MANHATTAN ISLAND



HOW TO BUILD A HOUSEBOAT FOR \$800.

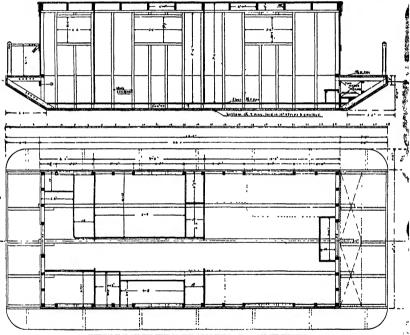
NOW TO BYILD A ROUREDAY FOR \$800.
The proposition of spending a summer affect is one which appeals to many persons fond of the water, but the cost of a year his targe enough to accommodate controllarly a family for a protracted period in prohibitive to the majority, therefore people swelter ashers in her and uncomfortable locks, and smatch such as-

during the summer season under equally comfortable conditions. The cost of the boat would vary, according to whether it was built by amateurs and how elaborately to whether it was built by manacers and now emportantly it was constructed and fitted up A moderate price ahipbuilder should build this boat complete with toiled and water tanks for five hundred dollars. At the boat is very simple in construction amateurs should be able to build it for about three hundred dollars. At a small additional cost an avaning could be rigged over the house-top, thereby providing a fine, large, cool lounging space.

For those interested in building such a boat them-selves the following hints on construction may prove maful

The first step in construction is to prepare the ground and build the sides and bottom of the hull The ground and build the sides and bottom of the hull That ground should be prepared by driving posts and using stringers and blocks so piaced that the bull may rest during construction on an absolutely level plane By doing this a level and plumb line can be used to get the house and its compartments built plumb and true After the building foundation is prepared, start by

so that they trend on the minds and are open about \$\frac{1}{2}\$ into counted. This is to allow the extitivity to be driven in and to provent it behing peubled clear through to the inside. In puriting the hull together we large plavament or noce in Board and the foreign and the better plant. The corner lot. A should be finesheed to the sides with \$\frac{1}{2}\$ to the purished from trives, and the bottom plant-careful that the planking fise perfectly flat and true obsore fractanting, otherwise leads will surely denote, which are hard to stop. Faint should be applied and frow threads of cotton intel along the oldge of the belief to help make a water-tight job. After the bottom is extrem \$2 \times 1
It might be well first to call attention to the two water tanks that are shown in the drawing. If these are to be put in it is well to do it now, otherwise some



SECTIONAL PLAY AND SIDE VIEWS SHOWING CONSTRUCTIONAL DETAILS OF THE MODIFICAT.

A solution of the problem of fiving cheaply and A solution of the problem of fiving chesply and comfortably fished is found in the househoat Buch a life ofters many charms and advantages. It is gitter-ally cooler on the water, and the lat is arresher and better being free from dust and land smella. Bishing a siraway "on itso," and the solution sirriery chain in a regard summer total if the locality becomes tire-some the louis-boat can be towed to another harbor former than the control of the control of the con-trol of the control of the control of the con-trol of the control of the control of the con-trol of the control of the control of the con-trol of

for a few dollars and there is no packing of tranks or tipping of evertast when getting out of town. The plans herwith shown represent a small house boat results of accommodating four or five persons comfortably for a very moderate price. It would cost four persons fifty dollars a week at an average-priced summer botte! This amounts to six hundred dollars of the months, without cartras. The heat shows four persons stry doubtes a week at an average-prison-summer hold. This amounts to six hundred dollars six three months, without extrus. The best shown there could be built for less than that Then at the end of aummer it could easily be sold for more than half its value or kept for another year. In any case there would be a very large saving over living salery

TO SIDE VIEWS RECOVERE CONFERENCESSEL DETAILS OF T getting out the sides. These are of 1½ inch yallow pire, laid three strakes to a side As the depth of the bull is 30 inches the sum of the three panks should be a side of the side of the side of the bull of the three panks and the side of the wood secowed to them. When thus secured fastes on the lower inside edges a yallow pine corner log 2 x 4 inches as shown in the cross section pine at A The object of this is to siften the odge and seford extra nailing surface for the bottom pine in New set up the sides in their proper places on the bullding franca-tion and be very careful to see that they are perfectly plumb and level, otherwise the whole streptures will be croated. Nail three or four strips across the bottom plumb and level, otherwise the whole streptures will be croated. Nail three or four strips across the bottom of the bull. These plants, as well as the better size of the bull. These plants, as well as the better size, are of 1½ yellow plant, and they beginning a 15th crosset to put on the bottom 1by beginning a 15th crosset to put on the bottom 1by beginning a 15th crosset to put on the bottom 1by beginning a 15th crosset to put on the bottom 1by beginning a 15th

of the deck beams and deck cannot be inic, and it is more trouble to put them in later. They should be of 1-16-inch galvanised iron and fixed with fitting plaked to come flush with the outside of the deck. The supply pipes can be run under the orbin flooring before it is

come name were presented to enable flooring neture propose can be run under the cable flooring neture for the case of the case

Scientific American

sengrely Put in the headers and sells for the windows and the stude immediately under them.

Proceed to finish the decks. Run 1½ x 3-inch yellow plue atriagers across the end stude 4½ inches below where the top of the deck will come. Use

plea stringers aroun the ent stude (4), in where the top of the dock will come. Use 3 x 3-inch yellow pine deck beams, seven not be a state of the deck will come the stringer and end board of the stringer and end to the stringer and end of the width or less, and after being well painted covered with No 10 cauran. As the run boards on either side of the hull will serve conveniently as a statenger for building; it may be well to put them on. The boards there is not beautiful to be stringer to the stringer of the st

the partitions.

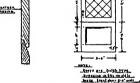
It is now in order to board up the sides. Use % x 6-inch rabbeted boards of the type shown in the section Start from the bottom shown in the section Start from the bottom and iny out the widths, as shown in the plan, so that they will come right for the finishing bands. Nall each board to every stud with two nails, and counterstak and putty the heads Tho sides are now roady for the finishing bands and window trim for the finishing hands and window trial:
Commencing at the corners put on the
vertical trim of % inch white pine 8 inohe
wide, and also the door trim. Then the
horizontal band under the windows and
which should be 8 inches wide and finally
the second band at cable top and the window trins, both is inches wide a fit the forepoing should be of %-inch white pine. The
trim at the window openings should be
set back to that a shoulder is created by
the window. The cross section plan will
show this. The windows are hinged from
the top and a wung outward, as indicated.

show this. The windows are hinged from the top and swung outward, as indicated.

Proceed to finish up the calain roof by planking it own with 1/16 the white pine boards ind in 4-16th widthe and having a tongree and grove with a based odge comment of the control
fastaning with copper tacks cover them up with a half round moiding, as shown in the plan. The doors and windows should be 1½ inches thick, and these

ton X some & street Cabe brane Hite's dan's adl avaner beeder 222 torm . If a wa spruce MARY PAR MARKET Hanna to you land





CROSS SECTION OF THE BOAT AND DETAILS OF THE DOORS AND WINDOWS

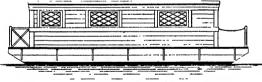
plans will be sufficient to enable any one to got them out The doors are of the Dutch type that is, they open in two sections They are more handy and con-venient when thus made.

An ornamental railing fore and aft, as shown, affords safety and convenience. The after side is fitted with a rops, which can be unhooked to allow bearding the craft. This completes the built

. which can be unhooked to allow bearding the This completes the luit, and we can now turn our attention to the interfor. The first step is to jet the eabin flooring and the painting the inside of the bottom. The floor may be of %-inch yellow luis.

Laid either in 8-inch widths or in nar rower widths, with tongue and groover. The former width is perhaps perforable in this case Begin at one ond and plant in the case Begin at one ond and plant of the performer width is perhaps perforable in this case Begin at one ond and plant of the performer with the perform

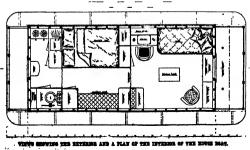
said and smoothed no. the partitions and cabin fittings are ready to go in The interior is arranged to provide sleeping accommodation for a mixed company of four Enterior the bous-boat from the after end the first com-boat from the after end the first com-tour from the after end to first com-ist turned into a sisceping room for the men at night. The decrease has a remov-sible tread, and is used as a locker On-the right a 8½ a 7 foot creut is installed, fitted with a spring and mattress. Neat to this is a deal with bookbetre above a folding borth, shown standing on end This is built simply like a bollow box, a folding borth, shown standing on end This is built simply like a bollow box, containing an ordinary spring and mat tress. It is lowered down for use and afterward up-ended and hold by a couple the control of the co





a V or beaded come White paint may be used but a a v or readed cage white paint may be used nut a very nice effect is had by staining the partitions and sind beams dark green and filling in between with groen buriap tacked in place and finished around the cornors with a nest little molding. The roof and house

cornors with a nest little moiding. The roof and house beams should be either white or a very light oils gray green. Varnish the floor and use rugs or mais of course the cable hides may be cried over but that adds somewhat to the expense and admills of a less torier is a rottow. After calking fishel for the ex-torier is as rottow. After calking the bottom plants with calking multy the seams and then give the bottom three costs of red antifolding pain! Carry this up the sides not 90 inches. Paint the rest of the hull black



three costs.

The boat is moored by securing chains on either side of the hull and leading them to a common chain about 15 feet ahead of the boat. Use three times as much eath as there is dopt to water and a 200-point mush room anchor, and there need be no fear of going ashore

sides for AU incase Frank the rest of the nill make.

A very dark red for the weather boarding looks well
Make all the bands, window trims and sash and deck
railings white. The decks and cabin top should have
four coats of a half color. All other wood should have

three costs

RECENTLY PATENTED INVENTIONS.

RECEIVITY PATESTED INVESTIGES.

Perializing to Apparel.

1934 UNID PARTS HANGET — R. (HIMMAR, No York N V This hanger is adopted to support in a smooth well formed manner the touthout it has a supporting lear and a clamping lar cross sealing with the bar, the latter leing adjustably secured at one ced and removably secured at its other call at its other call.

Of Interest to Paramera, CVITI OUVILLE A. T. Cox. Columbia, from Title invention relate to a type of cutte parents arranged on cross these of a rull coul and hasting yielding observe them to ununted upon the test that hinder the free passage of airth outer the guord and has for its object to provibe a goard that is officially in service, and greatly identical a traverse of the guard by its stock, without talary thereto.

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points under rounderstone being the mechanical points under rounderstone being the mechanical Planteness and Triputricars of Balanteron, 1721-1823 By Shummer Gilbert Wood. Blandford, Massa. Published by the unitor, 1808 \$2.00 in no small deserve the tavers and turngible in the small of the small property of the small property of the small property of the small incident, so the sulfree mediated to policit this monograph before remaining the larger of sivery a tracking to the publication of the which is necessarily narrow. Should this little volume incit with each such such as the variety in the such season as to variety the volume incit with each such such as the variety. It is the author's latentime value in this such as the such as the variety, it is the author's latentime which are little and property in the such as the variety, it is the author's latentime which are little sized of the look is a mountain of industry and many of the illustrations which are sirves above that of old New tractions which are sirves above that of old New tractions which are sirves above that of old New tractions which are sirves above that of old New tractions which are sirves above that of old New tractions which are sirves above that of old New tractions which are sirves above that of old New tractions which are sirves above that of old New tractions which are sirves above that of old New tractions which are sirves above that of old New tractions which are sirves above that of old New tractions which are sirves above that of old New tractions which are sirves above that of the sirves are sixtened to the sirves are sixtened to the sixten

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This is a popularly worded treatise on the lology of the sense organs, devoted chiefly a tactile scassitions or peripheral sense

organa.

MATTER AND SOME OF ITS DIMENSIONS.

Washington, D C. Woodward &

Lothrop. 99 pp SELECTED SHOP PROSERVE. By George O Seaton Peoria, 181. The Manual Arts Press. 12mo; 16 plate and 15 pages of taxt.

pages of text.

LEATT'S INDUSTRIAL BOLUTION WORLD.

CORPORATION By Melvin L Severy
Boston The Ball Publishing Company, 1908. 8vo. 594 pp Price,
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INDEX OF INVENTIONS

For which Letters Patent of the United States were lasted for the Week Ending May 3, 1910.

AND EACH BEARING THAT DATE (See note at end of list about copies of these patents.) A. S. Spiegel, 180 W Caldwell ,

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TWO POYEL MOTOR OLD

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'Questioned you need not be topologe the ground, appears to state still, while he solich sitilise over it. This is the motion that actually those place, for the top of the chain travels forward at rwice its speed of the sieigh. It will thus be seen that in resulty the lower part of the chain in contact with the

part of the chain in contact with the ground constitutes as unrise over which the vehicle itself can move. The driver has his position on a box behind the engine, which seat forms a receptacle for tools, spare parts and other accessories. That the vehicle has great climbing power has been conclusively proved, for it will ascend steep banks of earth and ride over serious obstacles castion in speed

Although this sleigh can carry a party and full equipment, its actual func-tion is to act as a tractor for the haulage of ordinary sledges, the trailing ve hicles carrying the loads. Upon comple-tion by the builders, the tractor was taken to Norway by Capt, Scott, and sub-mitted to some exacting trials on snew covered Lake Fefor and the tumbled covered Lake Fefor and the tumbled country in its vicinity, where the conditions were somewhat manageous to those prevailing around the south pole. Heavily laden trailing sledges were hitched on the tracter and numerous journeys were made among the Norweglan less fields. The vehicle proved itself fully capable of withstanding rough usage, and Capt. Roott spreased his complete satisfaction with the results achieved. Very different from this side in desire

Very different from this sied in design Very different from this sied in design is one which has lately been put to a series of severe running tests over all kinds of ice and snow in the district of the Silian lake, Bweden The accompanying photograph of the motor steleth was taken in the Easter days of this year, after the above-mentioned tests had een carried out.
The design differs from that of other

The design differs from that of other automobile sielghs in the driving mechanism. The sleigh is propelled by two driving wheels, each fitted with a number of steel paddles between which an elastic frame is fixed. This simple construction thus combines the advantages of a paddle wheel and the Canadian snow. struction thus continue the advantage of a paddle wheel and the Canadian mow shoe, having the propelling capacity of the former on fixed les and anow surfaces, and the supporting and friction capacities of the latter on loose sow The flexibility of the frame bands further of the paddle of the present the surface of the paddle wheels in case the snow to not compressed enough by the runners, the paddle wheels in case the snow is not compressed enough by the runners, the paddle wheels in the paddles engage with the compact snow by cutting through the runs task the paddles angue with the compact snow by cutting through the crust as knives, and worst on account of their breacht, against such a large wedge of the froses snow surface, that an effective counter presence is obtained with would otherwise during the paddles. The sleigh is in this transce driven by a 4-breas-power double-quinter air-cooled generate motor sleigh illustrated is designed to save only as a traction engine, to which active the states of the s

it is of course easy to make the motor sleigh as self-contained as an ordinary automobile, and the electrically-driven forejunners of this sleigh were success-

rovernmers of the seeign were successfully built in this way.

The motor sleigh is governed by means of a very ingenious and reliable stering device for remote hand operation.

The power required for steering is trans-

The power required for steering is trans-mitted from the operating hand-wheel through farithe steel tubes to the motor he the fastr a speed of M miles as hour over a smooth toe surface was attaled. When traveling over the mow and lea-dwared reads, which were in a very lead



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CO., Sec., Publishers of Sci 261 Breadway, New York condition on account of the prevailing thaw, a speed of 10 miles an hour was attained, the total weight drawn being over one ton. During a running test of several consecutive hours, the average

The inventor is a Swedish engir Mr H. Hakanson

An Industrial Enboratory for the Im-provement of the Incandecent Lamp.

Although the establishment of a research laboratory by a large manufacture ing organization is not a novelty, the in-ception by such an organization of a lab ception by such an opganization of a lab-eratory which has for its object the devel-opment of science rather than the improvement of some industrial commod ity is probably without precedent. For that reason, MY E. F Hyde calls atten-tion is a recent number of Science to the name physical laboratory of the National Electric Lump Association, even though, even though it is still only in a formative state. The object of this laboratory is scientific, the specific purpose being the development of those branches of science with which the those branches of science with which the art of lighting is closely associated. The fundamental idea which has prevailed in the organization of the work is the proper co-ordination of physics and physiclogy, the proper co-operation of the physiciat, the physiclogist and perhaps the psychol ogist.
The organization of the inhoratory is

The organisation of the ishoratory is proceeding with this idea as the founda-tion. The development contemplates no sharp distinctions among the different divisions of the work. The problems to be investigated, however, group them-selves roughly into three classes, and therefore require, in order to insure the insersors require, in order to insure the proper attention to each, a threefold divi sion in the organization The three groups of problems to be investigated may be classified as (1) those that have to do with the pro

to do with the production of luminous energy, (3) those that have to do with the utilization of luminous energy, and (3) those that have to do with the effects of luminous and attendant radiation Under the first class will come the in vestigation of the laws of radiation, and of the radiating properties of matter. The problems in this class are purely physical

problems in this class are purely payaical, and the corresponding division will be intrusted to a competent physicist.

Under the third class will come the in westigation of the effects of light and the attendant radiations on the eye, on the skin and on microscopic organisms. The problems in this class are physiological and the corresponding division is under the charge of a trained experimenta

Intermediate between these two classes of problems (the first and the third) which are distinctly different, there is another (the second) which forms the connecting link. Touching on one side the shyrical production of link, and on the shyrical production of link, and on the shyrical production of link, and on the shyrical production of the work will ashbese most of the selentific problems peculiar to illuminating engineering. Investigations of the absorbing, reflecting and diffusing properties of mat for, the measurement of light, i. e, photometry, and the study of the complex of the control of the study of the complex of the study properly come within the scope of this epartment of the work.

Selection (tider Making, Measts, Alliet and Gimel recently pre-sented a paper to the Académie des Sciences concerning the good results ob-tained in the production of cider by wash tained in the production or cuer by washing the apples with an oxidizing solution inasmuch as elder is the usual beverage of the populations of the north and west of France, its manufacture should concern hygienists as well as technicians. In many argument as went a tennerans. In many cases the quality of the product is much inferior to what it should be were the process well carried out. The washing of the apples is indispensable to free them from the imperities which they carry, but from the impurities which they carry, but we must also take account of the defective quality of the water which is available in many cases. The authors' previous re-(Concluded on page 498)



THIS VANADIUM STEEL GEAR BLANK

is 5% inches in diameter and was bent cold-flat upon itself as shown. without a sign of a crack or fracture.

Vanadium is an elementary metal; it melts at 1600 degrees 1; alloyed with iron in the pro-portion of one to two, it melts before the fusing temperature of iron or steel, and as Ferro-adium may be thus added to the foundry la the open hearth furnace or the crucil n iron or steel

When so added it combines with oxyge nitrogen and removes these gases in a fusible slag, making the remaining metal dense, nonous, homogeneous and stronger to a nurked

crosses the tensile strength and elastic limit of steel, it maintains the ductility, as may be seen from this experiment

A pocket knife with a Vanadium steel blade will cut chips from a steel spike. A carpenter's saw of Vanadium steel will cut through a two-inch gas pipe unharmed. Locomotive cylinders of Vanadium cast iron wear five times as long as ordinary iron without reboring. Forgings from Vanadium steel ingots are the strongest, most elastic and longest lived forgings possible Vanadium steel springs, owing to their freedom from crystallization, wear three times as long as carbon steel springs.

You are getting only partial results if you don't use Vanadum steel. Its marked wearing qualities commend it as the only material for railroad switch points and crossings, high-duty parts of all machinery, springs, gears, axis, and all forgings.

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(Concissed from page 407) searches showed them that oxidizing agents could be used to advantage, and they experimented with hydroxyl, oxonised water, and hypochlorites of soda exonised water, and hypochlorites on some and of lime in solution in the water which is used for the washing. Used in the pro-portion of 40 to 60 centigrammes per liter er (04 to 06 per 1,000), which is more than enough to destroy pathogenic germs of the human species, they find that hypothlorite of lime has a good influence the activity of the pectase, which is the congulating dissiance of the pectic matters of the juice of apples. Where the fruits arry much impurity they should first be washed in ordinary water before immersing them in the oxidizing solution The teste carried out first in the laboratory in teste carried out first in the laboratory in 1905 were pursued in the cider-making districts during the seasone of 1907-8 and 1908-9, and they led to the following concinsions First, the addition of hypochlo-rite of lime in the above proportions acrice of line in the above proportions ac-cording to the state of purity of the fruit, assure the purifying of the doubiful wat-ers as to bacteria for the present purpose ers as to cacteria for the present purpose. The juice of the fruit thue treated is found to cisrify rapidly. The coagulation of the pectic matter is always well carried out and we have formed an abundant brown eurface layer. This assures the stability and we have returned the stability of the cider with time in this respect. The disatases, especially the meloxydase, are eliminated by precipitation, so that we avoid the principal cause of darkening of the cider. It is also found that the hypothesis of the cider is also found that the hypothesis and the cider is also found that the hypothesis and the cider is also found that the hypothesis and the cider is also found that the hypothesis are the cider is also found that the hypothesis are the cider in the cider in the cider is also found that the hypothesis are the cider in the cider the cider It is also found that the hypo-chiorite has a favorable selective action on the Baccharomyces mail and a destruc-tive action on the anseroble germs, and it thus solves practically and simply the thus solves practically and aimply the problem of a pure formentation By adding to this treatment the method of repeated underdrawings, we can obtain closer which will keep much longer, and this is of interest for producing bottled older. There is no harmful matter introducing the second of the second or the second of the older There is no harmful matter intro-duced by the present process. Compara-tive analysis of cider made from treated and from untrated apples shows a marked advantage in favor of the former.

Rithery Kites, as well as dirigibles, captive balloons, and soropianes, may be made serviceable in military scouting, and their empileity makes them especially valuable. Furthermore, they can be emvaluable. Furthermore, they can be emplored with any velocity of wind between 16 and 65 feet per second, whereas the use of a captive bailoon becomes difficult if he velocity of the wind exceeds 26 feet per second Experiments recently made at Boulompe by Capt Baconney show that it is quite practicable to carry two persons by means of a large kite. The kites used in his experiments were of the Cody type with four sustaining planes and with triangular stabilising wings In this method of construction wings in this method of construction each rectangular cell is strengthened by diagonal reds of bamboo to which the stabilising wings are attached. The ap-paratus consisted of a series of kites conparatis consisted of a series of after con-nected together, for the purpose of sup-porting the cable, and of a second series of kites attached to a very light carriage, which moved along the cable, and from which the car or basket was suspended

which the car or basket was easyended Kilcs can nearly always be used at sea and on the coast. They are simpler and less expensive in every way han bullcoms and they are also strong and easily repaired. These qualities should make them valuable for many purposes in military and especialty in naval opera-

A wireless telegraphy station near Berlin claims to have established a record in combined overland and sea transmission of wireless messages. The station recently succeeded in maintaining wireless communication with a Woerman iess communication with a woermann illner during the entire voyage from Hamburg to the Cameroon The greatest distance signaled was 8,600 kilometers (over 4 000 miles) Although messages had to pass over the Alps the Algerian tablehand, and the Adamana Range, com-Garden Notes murcinsu, and the Adamana Range, com-munication was, it is stated, effected with astonishing case,



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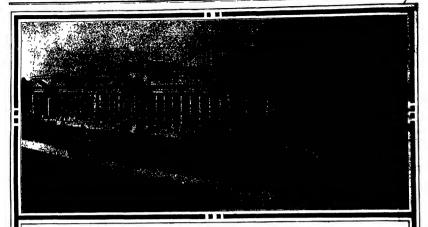
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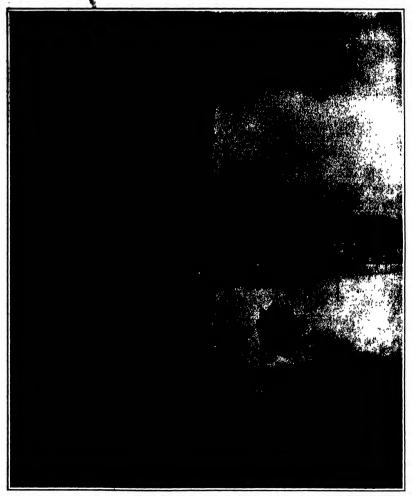
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A POPULAR ILLUSTRATED WEEKLY OF THE WORLD'S PROGRESS

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Qil was stock as 4,000 feet depth. The scenar reshed forth with such violence that it high self the top of its derick and non-ever 200 feet above the ground. (Alline in a which relationship of each take. Its well has continued to poor feeth oil as the rate of \$2,000 to revelope after forming, the large take were as the forex-round of the picture.

Scientific American



SCIENTIFIC AMERICAN

ESTABLISHED 1845

MUNN & CO , Inc . Editors and Proprietors

Published Weekly at No 361 Broadway New York

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THE US TO STREETHER GIVEN STATEMENTS STATEMENT
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NEW YORK SATERDAY MAY 21st 1910

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NEW SEYSCRAPERS FOR OLD

A titel, modern indestrate conditions thing are done in a big way and often with a strong dash of the apertacular But the hely six-ler, alkelt b. is duly confronted with the unusual and the unexpected must confess some measure of surprise and parenting that a nudern abyseraper 300 feet in highly, and but a down year out is to be corn down to make way for a new structur which is to be several studies highly, and must a down year appointer if you presse fo the conservative Europeant of the property of the conservative Europeant of the property of the conservative Europeant of the property of the conservative Europeant Eu

The policy is purely utilitarian—buttally so if you like—a mere question of dollars and vents, but it is a good business policy nevertheless, and, in reality has been one of the most powerful foctors in bringing about the present phenomenal industrial development of the United States

Your old world engineer or architect with perhaps a stronger lines wie southerntain, healister to aweep a faithful seriant so remora leastly out of the way leastly the will point with his prider in his forty year-old toconcite with its utilities made a souther strop or two for a building, if this he possible reather than rare to the condations and build from the ground up It is a case of cash to bis a holt, though there are not want or many limited to the condations are southern engineers are besting many indications that little engineers are besting many indications that little engineers are besting many indications that little engineers are besting many indications that of the engineers are besting many indications that it limite engineers are besting many indications that it limite engineers are besting into practice in the development.

of their infantital enterprises. The different building which at ands at the north west corner of Nassau and Wall streets, in this city as a street-story selectrame office building which was completed in 1898. The countraction was first least, the foundation being outdown by the puter matter process and the site! from Lorengably braced to reside with and realize written. From street to create who and realize written From street to create the abtern stories a street to create the abtern stories a street to create the abtern stories at the create was the street of the initiality of the street of the treet and the processory tower desired to the street of the initiality of first streets and the street of the initiality of of

thoroughly painted at the mill, at the shops, and before it is inclosed in the building, it is absolutely proved against rusting and will remain intact and serviceable as long as the inclosing waits and roof endure Chaisle of rusting, there is no other known agency that tends to shorten the life of the steel frame of

Omittle of rusting, there is no other known agency that tends to shorten the life of the steel frame of hir modern skyacraper. Exploded long ago was the thousy of the fatigue of metal Simple statical stresses or even dynamical attents of frequent repetutions of the stresses of respect to the stresses and the stresses appreas the classic limit that the strength of the metal is imperited—saud in the modern skyacraper no such conditions exist. Ocraits imaginative magazine writers to the centrary notwithstanding, the visitor to New York five hundred or a thousand years better will find the skyacrapers of today in perfect condition, provided, of course, that the doctrine of the string constitution of the string the strength of the string that the doctrine of the string constitution of the string that the doctrine of the string constitution.

OUR WANT AS A MATIONAL INSURANCE.

A Tibe re-ent tames of the "Plerida," as the grant ship was assing down the way one of the troad was heard to remark 'Weath as shannful waste of public money it to was heard to remark the waste of the support of the two work for which abe was built, and that if she ever got a into a fight, ahe may be ent to the bottom within a two uninstees of the opening of an action. The remark was characteristic of the wasteriness of modern armaments. Taken by titled it to work earn to be convicing, but if we look at the question bready, and with that hous sense of the value and menting of things we shall see that proportion which is necessary to a correct cetimate of the value and menting of things we shall see that a buttlenhip mose the judged to relation to weat it sinds for and the work which it is intended to do in the last analysis the "Florida's in me elements in an extension that the transfer of and the work which it is intended to do in the last analysis the "Florida's in me elements in an extension of inhabitants of the United States.

The true test of the question of the extravagance of navi expeditures is to determine the ratio that they bear to the ninear value of the property which they proved. The following suffuniace of expenditures, which have been furnished from Washington show that the flart cont of the ships of the navy, as they float inday is roughly \$400,000 000, while the current names expenditured that the flart control of the minimal expense of their maintenance is about \$44,000,000 The cost of maintenance last year, including yad officers and enlisted men of the navy and marine corpu pilot dues provisions, elothing, ordanace cultiment, medical and machinery stores is including cost, water and other list identities amounted to nearly \$10.000 to \$100.000 and equipage of it he vessels amounted to nearly \$10.000 and equipage of it he vessels amounted to mach \$4,000,000 and high the combined expense of pre-

serving peac on one shures pearly \$44.000.000.

The amount involved covers the expenses of all the various types of our ships of war which include bat tleships armored (ruleers, cruisers secuts, the tor pedo flottlis insulinors, guitheats, supply ships, loopy in the peach of th

As an Example of the heavy expense of maintaining a big ship of war we may take the butterhip Connecticut which was the flagship of the Atlantic fierd during the last year. The pay of the officers and estimated nice of the navy and marine copas attached to the vessel and the expenses incidental thereto amounted to nearly \$800,000. This did not include the

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With the increase in size of the hattlenkins, they is a corresponding outler for pay of the premoning, is a corresponding outler for pay of the premoning size of the premoning of the premoning outlet of the premoning of the pre

the United States.

If the show seems to be a strong statement, capable of easy proof. The latest estimate or waste of the United States variable in the Busin of Statistics is that of 1904, made by the Cenaus 9 17, or \$1,310 per capita. The 4's millions which his navy cost is at year may be regarded as the coupled hourance against damage and loss of that 107 Statistics are not succeeded by the coupled for the company of the statistic statistics of the company of the coupled the interest on the capital cost (400 millions) of sections of the coupled the interest on the capital cost of the "Plorida" 30 millions) which becomes on large in the eye of the capitons critic at her issunching dwindless to one one-many control of the capital cost of the westils of the cost-underded for one pre-cent of the westils of the cost-underded for one pre-cent of the westils of the cost-underded for one pre-cent of the westils of the cost-underded for one pre-cent of the westils of the cost-underded for one pre-cent of the westils of the cost-underded for one pre-cent of the westils of the cost-underded for one pre-cent of the westils of the cost-underded for one pre-cent of the westils of the cost-underded for one pre-cent of the westils of the cost-underded for one pre-cent of the westils of the cost-underded for one pre-cent of the westils of the cost-underded for one pre-cent of the westils of the cost-underded for the cost

THE UTILIZATION OF SOLAR HEAT

If the heat of the nuus rays were entirely some verted into mechanical energy, it would furnish more than two horse-power for each square yard of surface exposed to the sun, but in practice it is difficult to utilize bolar heat. Attroppis were made in France by Woochot and Tellier in 1871 and it is difficult to utilize bolar heat. Attroppis were made bolar containing water or other vosaille liquid. But the mirror was contry and it gave only one bone power for 12 square yards of reflecting surface. Tellier, in 1885 caused the sam's rays to be absorbed directly by a insulate bolar, containing a limit intervolved of the sam's rays to be absorbed directly by a insulate bolar, containing a limit intervolved of water or more vokatile liquid, such as ammonia or carbon more vokatile liquid.

Justines also employs a fameriar botter covered with beautiful the same heated in this botter is used to experies the more volatile liquid ammonia or subjust districts the more volatile liquid ammonia or subjust of the properties of 100 square yarde of heating surface, furnished a mean power of 100 square yarde of heating surface, furnished a mean power of 15 horse-power. Williese estimates the cost of the appearitus at about 18 flop er squares yardened estevilates that it should about, at the 3th power and estevilates that it should about, at the 3th power and estimates that it should about, at the 3th power and estimates that it should about, at the 3th power and estimates that it should about, at the 3th power and estimates that it should about, at the 3th power and estimates that it should about, at the 3th power and estimates that it should about 100 percentage of the 3th power and would cost \$80.00 per cost of power to 400 horse-power however the total first cost per horse-power would be doubled. The cost of operation is about 350 cent per horse-power.

In experiments made at the agricultural station of Laumane Switzerland, for the purpose of determining the state of the st

Scientific American

ENGINEERING.

TO THE REAL PROPERTY OF THE PARTY OF THE PAR

Relationed commets continues to widen the range of its application. The Western railroads are preparing to shall this semmer long stretches of reinforced concrete mow sheds. These will not only be stronger than the present timber structures, but they will be entirely safe from the meason of fire

eatherly safe from the meason of fire The independent guardine-of-ther national motor car, which we have frequently illustrated in this journal, is growing in Arove A new car, 70 feet in length, recently left the independent of the buildings, recently left the independent of the individual mounth car of the type to be turned out from the shops, and it is the sixth car to be built for service cast of the Mississippi River

The over-normalize weight of Wester passenger trains is being mat by a steady growth in the size and power of the focumentres. The Chicago, Milwaukee & 8t Fani have recently turned out of their shops we types of six-coupled simple locomotives, with originaters 32 inches by 31 inches, use of which has chicago descriptions of the control of the contro

and assistantially operated pile driver is described in a data electrically of the Bielettian Review and Western Electrician. The apparatus which is of English make provided with a revolving frame and servel leaders. Instead of a mechanical device for gripping the monkey, an electromagnet is used, the iop of the monkey being planed off smooth to provide a good contact surface. An electric motor is used for operating i holeting evah. The circuit of this motor includes lab magnet, and the switch for the latter is attached to:

us accompanies paper on oils used for switcher and insufference was recently read at the Manchester nession of the Institution of Electrical Registers. It was pointed out that very little situation has been paid to the quality of the oil used in this way, and that any importly in the oil would reduce it or relat ance to a flow of electric current, also that the specific cuitance at different temperatures waries will the consistence at different temperatures waries will be the continuous of the continuous continuous and the continuous continuous and residence values.

and resistance values. It is a research technique before the Engineers' Club in New York, Mr. Elians A. Sporry, the olectrical read in New York, Mr. Elians A. Sporry, the olectrical read to the second seco

Amorica will be represented this year in European speck racing by the large and powerful two-masted ashonor, "Westward," which has been built by Hercels Def for A S. Cochrane of the Naw York Yachi Zendi The "Westward is the largest American racing schooner yet sent across the Atlantic She is of 197 ions gross, as compared with the "ingemar," of 145 cons, also built by Herrschoft, which a few years ago made a Brilliant record in English and German waters and "Germanica" and probability one or two Ragilah built schooners of loss size, but of proved spend and shitty

According to A. A. C. Swinton, the first fight to a model scroping propelled by stems is to be credited to the Nen Charles A. Parsons of turbine fams, who in 1888 built an ancopian with two 11-toot wines and a iall, and drova it with a steam engine whose cylinder was 144 inches diameter by 3 inches stroke, Mean being supplied by a boiler 344 inches diameter by 1 inches long, in which sissess was generated at 50 pounds preserve by a spirit tamp. The whole apparatus, invivaling seropians, engine, and Incl., weighted 448 pounds, and it flew for distances of 160 yards at a height of 20 feed, coming down ofply when the steam

pression tell

We have been favored by Mr. George Westingkoose
with the following particulars of his new reduction
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PLECTRICITY

The conditions under which a street lamp should prove in afficiency are very different from those which govern the Indoor lamp. This was brought out clearly in a recent deferes before the New York Section of the Itiuminating Engineering Society by Dr. Clayron it Sharp. He pointed out that while in the building it is advantageous to have much of the light of a transcription of the state of the case of a street lamp this would be a great fault for the vertical rays would be lost. Only those rays that are cast directly downward and horizontally up and down the street can be utilised. For this reason has devised a reflector consisting of a pair of para bolk, mirrors arranged to throw the rays in the divention of the sever on that post-carright and of the high control of the contr

The block signal systems of steam realizeds have litherto bot no perstad with direct current from single batteries. This has always been as expense owing to the inconvenience and difficulty of maintaining the storage batteries. In revent times trolley roads have been using an atternating current signal system which has been found to work very estimated they and the monounterment has just been much tilty, and the amounterment has just been much the hard hard payed on the first hard been realized as a state of the season of the season of the season of the season of siternating current for teams realized the season of siternating current for cause rational calculations and the season of siternating current for cause rational calculations are season of the season of siternating currents for scenario signaling purposes and if found satisfactory should do much toward extending the me of block signals on the season of t

In an article appearing in a recent number of the Ricertic Rathway Journal some very interesting containant were arrived at conversing the question of the cost of a stroot-of-ride. The which number of the cost of a stroot-of-ride. The which number of the cost of a stroot-of-ride. The which number of the cost of a stroot-of-ride was contained as man (as made for unwelling the cost of the

La view of the revent agitation in favor of color estrict headlights on locomolives, the exp. rimerical along this time by Prof. Benjamin, of Purdus Halver 1817, are most interesting. Prof. Healpanin has lower only does the atrong beam of lithel find engine of much to be said against the obstric. Is callight. Nor only does the atrong beam of lithel find engine on locomotives coming from the opposite direction to be a surface of the complex of the comsistence of the complex of the comlete of the comlete of the complex of the comlete of the comtent of the complex of the comlete of the comlete of the comtent
Considerable attraffice has been directed of fate in the inferious effect of vertain rays of electric issues upon the eye A very interesting communication upon this subject was recently presented by Dr Stockhausen before the Hiuminating Engineering Sciency of Indiana, and he pointed out that an exceptive of Indiana tearing, no matter what its ware length is indiana, and the pointed out that the red and infra-red rays on account of their heat values are very injustrous to the retina, but Dr Stockhausen does not believe that mader ordinary conditions are very injustrous to the retina, but Dr Stockhausen does not believe that mader ordinary conditions are very injustrous to the retinal, but Dr Stockhausen does not believe that mader ordinary conditions are very injustrous to the spectrum of the spectrum of the produced on the precious of the produced by the proper to the those which belong in the extreme with values of the produced by questionized the proper in the light produced by questionized mercury vapor impe As ordinary them is necessarily the stander mercury vapor impe As ordinary them is

SCIENCE

A telegram has been received at Harvard College Observatory from Prof. H il Campbell director of the Lick Observatory, stalling that 'Frank McClean cables from Hobert, Tasmania, steady rath, eclipse instable.

A new inflammable celluloid has been patented by Prof A Gautler The chief feature of the process is the employment of an ether allitate instead of pure ether, which is ordinarily used with alcohol as the solvent in the aggituitation of nitrocellulose fibers by means of campbor

The University of Paris and the Pastern institute have been authorized to conduct jointly a independent product pointly as property of radio-activity located in Paris. This new independent property of the Paris of Paris of Paris
What does 'guld filted means' Probably most probe who hay agaid filted walches faury that they are my steriously imprognated with gold. As a matter of fat, the tran in misleading. Out off filling consists in taking two abects of gold between which is placed section of solder-consists bare mital. This mental mandain is included in the section of solder-consists bare mital. This mental mandain is leasted and present on the filter consists of the consists of th

Dr. B. B. Barnard of Verken Observatory Informs that despite the haze and tound of the early more to at flay 7th, 1910 he obtained fair principles of the 1912 or the observation of May 7th, 1910 he obtained fair principles are also become on the photosymber. A fail about 10 deg. Iona, Supervet to the photosymber. To the naked eyes it was unly 12 deg or 18 stog Iong. The bead was of the second magnitude. In one pitture the tail showed separately in three strands, some fair or six degrees from the load. The come! was a heutiful object on the numbries of May 9th and 7th.

In a recent builtful issued by his observators. Mr iverview Lowell dear these his newly-discovered. Martina canals. These new causia are two in number and wret discovered in September 2016 1909, to the east of the Nertia Majar where no canals had even previously here are it is not to the seat of the Nertia Majar where no canals had even previously here are it They were most complexous Not a trace of them could be found to the record drawings of August July, June or May when this part of the planet was depicted nor could any trace of them be found in the records of previous years Not Lowell admitts the possibility that the phenomenon might has on that could have been seen before his public of the canals in question. He reparts he vidence as incomp that the samls are not simply the vidence as incomp that the samls are not simply the vidence when the time of th

Light to of try and the total are to sign growing on the on bottom and in their struggle to obtain light the plants assemble in structure of several souries. The algoe of the genue Laminaria adhere to the rocks by means or disks. The wounds made in the plants by the attacks of animals become contention of the second of the second of the protective serveion in which the countries proves which the sex water contains become contangued and grow. This layer of epiphysics is covered in a secule animals the selection of which he regain covered with also. In addition to those variegated attractives in which has proved attractives of asign which have been torn by winds turn this and animals take root upon other algo-and form attractives of several layer a Pur campit the delicate Principles and person types of the delicate Principles and the second of the development of the European second of the development of the European second of the development of the development of the second of the se

The miseral waters of Vehy Clermont Ferrand, More Doré and Sin contain fluore-term abstances in New minute, quantilies. The quantity of fluore-sent matter riche increase with the temperature of the water and diminishes as the amount of solid revision leaves at logar and adminishes as the amount of solid revision. The largest All Siga the amount of shortward matter has been diminished by improvement in pipion. The largest atlanta is the results are of practical interest in connection with the piping of noticeal springs. Nearly all natural salers whether bookshe or containstand contain organic solidance which are airgreafy littor exercised and other solidance of the solidance of

COMET NOTES.

The Lowell Observatory has Issued a buttetin sortified Preliminary Notice on Photographic and Spot troprayble Observations on Itality's Connet. The observations consist principally of direct photographs of the counts and shotographs of the connet and shotographs of the spot and
The grad square of Pegana areed as a splendid state of the control of the two control of the two control of the two control of the two control of the contro

and it is unfortunate that the chance of capturing a sample of the tail of Hsileys comet was not solved. The passage of the earth through a conset's tail is a rear an occurrence that no opportunity should be missed. In the April number of the Bulletia de is Recletá Astronomique de France, C. B. Guillaume suggested the Househorton of a large crastic of all tillation, and possibly some country matter recognized. He possibly some country matter recognized the politic double that very misuic quantities of the rarge gases, such as trypton and argue, are to secured fram immense votumes of air and that it is excured fram immense votumes of air and that it is now possible to inquely 1000 cubic meters of air per hour it is just possible that by this means classifities in Industrial operation.

an industrial operation.

An investigation of Encks comet by Dr. Backland above that the acceleration of the mean motion of that body between 1861 1861 and 1904 was not constant Dr. Backland suggests that the resistance within would explain the phenomenon is a naneorio searm in the neighborhood of the control of the season of the control of the control of the definition of the density of the resistants medium than to thanges in the comet itself. Dr. Backland and the control of the

no explanation. The passage of the earth through the tail of Haller's counce has def Finamarion to auggest that it here is any pal hable material at lance from the bead it might be possible to measure the minour rise of tempera ture produced by the earth as it uranhed through the tail at the rate of 4x miles a

but offers

Although comet.
A 1910 has sped
away its peent
the aubject of as
tronomiclat comment. Thus Dr.
Wolt commants
upon a conteal
extending from
the oblige of the
come toward the

ent from anything seen in previous comets, and having the appearance of a miniature sodiscal light.

the appearance of a miniature sodiced light, it was to be expected that the apparition of Halley's comet would not remain without its effect upon the more ignorant peoples of the world, even though this



PROTOGRAPH OF HALLEY'S COURT TAKEN BY DR. R. E. BARNARD ON MAY 8, 1910

is the twentieth century, and the days of superstition are supposed to have passed Reports from China state that the comet was used as an onzen to inflama riotars in disaffected districts. To be sure, the authorities tried to counteract these attampts by subliting pictures of the conset with an account of its preions appearances without III affects, in order to reaster the native. The Chinese situation files in the counterpart in Europe. The spicide of a Hungarian framer "on scount of Halleys's count." as the suppapers have it, is followed by a report from Odessa that in Seculara Fixuals there is a verticable popular terror which is being applicably by unserqueston parterror which is being applicably to macropiston parpares of contacting means for special property.

prayers, etc.
Observations of Halley's comet made in Harrard
Coljego Observatory on the morning of May 6th lead to
the following results. The brightness of the nucleus
of the comat was measured by Prof. Wendell with
the 15-inch equatorist, with the resetting magnitude
706 The nucleus was, therefore, distinctly fainter
than on April 15th, when is unapplinde was 601. The
total tight of the conset was greater, being estimated
by Mr Caspella an anguitude 3.2 Three photographs
of the conset was the conset of the conset was present, being estimated
and nucleus. A long tail was above, which was
found to the conset of
THE ACCIDENT TO THE "SEPPRISE"

lay In a tangled mass
The cutatropho of Weithurg is the fourth susiation
by dirighibe alreships. The first was that of the French
oldrights "La Patrie", which during a trial at Ver
dun on the 59th of November, 1907, had to land in
the viriently of Buesnee: The notitionring, the wind
changed to a bowling hurricane. The soldiers who
were in charge of the airship were compelled to retew minutes the "La Patrio" had vanished, and was
never seen again.

never seen again
The next great catastrophe destroyed the "Zeppelin
IV," while Count Zeppelin was on his famous 24 hour
record trip of the
4th and 5th of

ne ramoul 32 nontrement of the contrement of the

a few minutes.

The next extention to plan affected the French dirighter (Republique.)

The destruction of the "La Patrie" and the (Constant)



By coursely of L'Ulimetrate

THE WARK OF THE REPORTS ALL SHIP AT WEREHARDS. .

THE THORNE-BAKER TELE-PHOTOGRAPHIC APPARATUS

AN INSTRUMENT FOR TRANSMITTING PICTURES WITH AND WITHOUT WIRES.

On the avening of May 11th, Mr. T. Thorne-Baker delivered a betwee before the New York Electrical Sotaty, in which he regulated the experiment of the comception of the companion of the companion of the experimentally tried out in transmitting newspare; spittures between New York and Boston. It has been he used by the Dally Mirror of London, between Paris and London, and Manchester and London since Dally 1890. With some modification, it can be adapted to the wireless transmission of pictures.

the virteless transmission of pictures, sider Thorn-Baker's apparatus employs no selenium office and prints the records electro-chamically A print indused from a photographic negative in sessitized that side on lead foil. The print is made in the usual side, and the patient process of photography This side, as in the select, as in the select, as in the select, as in the select, as in the patient process of photography This indices the drum of an Edition photograph The receiver consists of a similar revolving motal drum one which a platinum stylus traces a belief lime on appear impregnated with some coloriess electrotyte, the nature of which is not revealed Whenever the transmitter of the stylus tenders a clear part of the transmitter of the stylus tenders a clear part of the contact of the contact of the stylus tenders a clear part of the contact of the contact of the stylus tenders a clear part of the contact of the contact of the stylus tenders a clear part of the contact of the contact of the stylus tenders a clear part of the contact of the contact of the stylus tenders a clear part of the contact of the stylus tenders a clear part of the contact of the stylus tenders a clear part of the contact of the stylus tenders and the contact of the stylus tenders as the stylus tenders as the stylus tenders as the stylus tenders are stylus tenders.

strengement of the apparatus

'The leaf offi picture is broken up into thin and thick
likes with spaces injervening. The stylus tenches the
lead base or the fish give lines, and the time of contact depends npon the width of the line. Hence the
width of the times datermines the periods of tha line

extracts.

The apparatus is need over a telephone line, the sizesit being closed by the two styles 8, and 8, and the vessel telephone line, the sizesit being closed by the two styles 8, and 8, and the spill resistance W. W, of 1,000 chms, in short. The variable outdoors of a shunded across the variable outdoors for sizes, and the currents used to sweep out the resistances W, and W. Those line currous frow through sacces W, and W. Those line currous frow through early R, connected the line is sized and evenly distributed, less frowers current is required with it. When the hands on the line is great and evenly distributed, less frowers current is required from the balance (a device employed to wipe out residuary currents from the line in [8]. See M. Trees.

less reverse current is required from the belancer (a device employed to wipe out residuary currents from the line in the way frequently made use of in depic teleage of the reverse batteries B, and B, considerably greater contrast can be obtained in the pictures. The finer the balf tone screen employed in splitting the balf tone in the tilest, the higher must be the

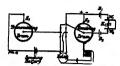
In all tole-photograph apparatus in all tole-photograph apparatus the problem of synchrondem is on that has always bothered the transfer of the problem of synchrondem is on that has always bothered the transfer of the problem of the departs, as well as by if Bakar has been adopted by most revent designers, as well as by if Bakar has been adopted by the base of the department of the department of the problem


Fig. 1.-General arrangement of the amearatu

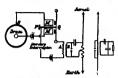


Fig. ?.—Apparatus for transmitting pictures wirelessly

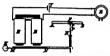


Fig. 8 -Relay employed in the wireless apparatus.

drum, and the drums are always re-started in unison
One advantage of Mr Baker's system is to be found
in the fact that the patire operation of transmitting
and receiving occurs in full view R is not necessary
to develop a picture before discovering whether any

thing is wrong with the apparatus. Furthermore, the transmitting cylinder can be used as a receiving cylinder, if necessary

The ordinary two-station instruments fit into two boxes of moderates also A portable apparatus, howover, has been devised by Mr Baker, which be claims can be carried from place to piece by an operator, so that pictures can be prepared in the field and telegraphed on Thus plans, positions of troops and ships can easily be transmitted Perlassy that feature of Mr Baker's researches

Perhaps that feature of Mr lakers researches which will interest the rederes of this journal most in the subjection of his apparatus to the innanutation of the subjection of his apparatus to the innanutation of the subjection of the subjection of the subject of

mitted in composed. When we will be done with the aid of a work of the composition of the confidence of the confid

ning ring, a which attracts the armature M This motion brings with the timinum connect P against the contact plant the color bring and the color of
aignals

A special form of Fintheven galvanometer is employ of by Mr. Hs

ker for working the relay which
galvanometer has never intense
magnetic field. Invited of the
usual silver wire a silver query

fiber one twelve hundredth of an

lach in thickness is employed

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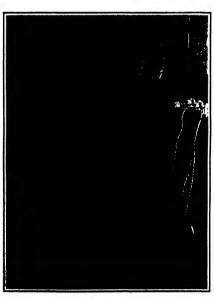
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which is thus opened by the coefficients of the country side of the strip is over a fine silt,

which is thus opened by the coefficients in order to be able to use

strip sides in order to be able to use



RE, TERRESPARER AND HIS TELEPROTOGRAPHIC APPARATUR.

Ber 21, 1944

a wider all! Mr Sanger Shepherd has fitted the appa into with a fine abutter, and in that case the receiver through the tunneled poles of the electro-magnet, and a pair of narrow commensated selentum cells is pisced tind the siit, a positive lens being interposed dot received shifts the fiber laterally, light fails on the seienium cells, and their reduced resistance allows a battery to actuate a relay which throws the tale photograph receiver into circuit

HOW THE "PLORIDA" WAS LAURCHED

The issue bing of the 'Florida,' which took piace strictly according to schedule, at the Brooklyn navy pard on the morning of May 12th, was usually brilliant function. In its lechnical in its lechnical aspects nsually brilliant function in its lechnical aspects the launch was particularly successful, and wo offer our congratulations to the naval constructors who were directly responsible. The ship is now tied up at the many yard dock, where she will receive her side armor, which is sirendy assembled at the yard, and her turreds which are also about ready for placing

A most interesting feature of the day was a dinner n edebration of the event, given by the empi of the yard who built the ship. This event at which some 1 200 were present, included among the aposters Vice President Sherman, Governor Gibbriat of Florida Assistant Secretary Winthrop of the Bavy, Ad Leutre the commandant of the navy vard Naval Con structor Baxter, and others. (apt Baxter referred to ... acroug personal interest taken by the whole for of men who worked upon the Florida" in the succ of the ship To the Bellior, who was present as guest, the genuise cuthusiasm raised among the m whenever any refer ence was made to the the strong personal interest taken by the whole force of men who worked upon the Florida" in the success

the yard, and ship. its officers seemed to be a atrong indorse ment of the policy of having at all limes a batticship under con-struction at the New York yard

in response to sev erai inquiries as to just how a battleship is launched, we have prepared the accom-panying sketches, showing a portion of the isunching ways mer the bow The "ground' ways con-sist of rows of piling driven to a solid bear ing upon which are spiked heavy, square timbers, or "caps," ilmbers, or "caps, running transversely Upon these are laid series of heavy, longi tudinal square tim-bers in three parallel lines, one immediate neath the keel and one on each stde

of the ship between the keel and the hilges Duriug construction the weight is carried upon the keel blocks and upon hundreds of aboring timbers. When blocks and upon hundress of aboring timbers. When ship is ready for isunching and a few minutes before the actual taunch libe weight of the ship is ready for isunching the chib before the actual taunch libe weight of the ship is rundrered from the central thou thorks and the shoring timbers to the two parallel lines of launching ways. Each permanent way, built up of heavy, sequer timbers, presents a stilling sarriare four twide exceeding the whole length of the ship and permanent ways are fainteed frust down to the cross sequence and pilling below. The issue hing ways which are also four feet in width, are attached to the hull of the ship, and more with it down into the water Dictween the under surface of the permanent ways is a tible? the upper surface of the permanent ways is a thick coaling of grease, oil, and other lubricating aubstances. The launching ways have to be moided to the form of the laint into which they form a crade, and our draw ing shows part of the cradie near the bow, which is known as the forward "poppeta." The poppeta consist of six acts of 14 inch by 14 inch timbers in groups of half a dozen. At their upper ends these groups of nair a dozon At their upper some times timbers bed against heavy angle iron bracksts, and at their lower ends they rest upon what are known as the "trushing timbers" long lines of parallel tim-bers four feet wide the bottom one of which forms the aliding surface of the launching ways. The abovemontioned angle trons are riveted to steel straps from a half inch to three-quariers of an inch thick and 43 inches wide which extend down below the keel and up to aimiliar brackets on the other side of the ship The space between the straps and the hull is filled in

with four inch white pine timbers, which form the with four inta white pure timers, wann form the bod in which the bow of the vessel rests. To assist in tying the whole cradle together, heavy wire ropes has beneath the bow and are carried around heavy oak thimbles, placed on the outside of the poppera. Further support is given by 15g inch tie rods, which are drawn up anugty by nats on the outside of the

The crushing timbers are provided through their entire langth with a series of oak wadnes intertheir entire inagth with a series of oak wedges intor-posed between them and the launching ways below About haif an hour before the launch, hundreds of workmen range themselves up and down the ways, and by means of beavy sledges drive these wedges forcing the launching cradle into clo noun, precing the inducating cradie into closer con-inct with the ship, and avantually lifting it sufficiently to clear it from the keel blocks, thus transfarring the load entirely to the launching ways.

tone entriety to be insumening ways.

This brings us to the consideration of the interest
ing method by which the ship is held in place, and
prevented from starting off down its wail-greated "toboggan" until the exact moment when the christening performed and the order is given to lat go king and starting gear are as follows

ior-ting and starting gear are as follows. The hardwood inunching ways are extanded forward and airongly bolied down to the ground or permanent ways. After the wedges have been driven home, and the ship is resting on the inclined and well-greased auriaces it is prevented from moving solely by these bolted connections. At the criti-cal moment, at the word of command, carpentars armed with cross-cut saws commence to saw through these timbers, and as the cut is made, a point is so reached where the tensional strength of the rema

of appeals understonly support of delay and expense, throws Commissioner the impossible upon an over-butt task of giving to Commissioner the impossible stall of giving to e-case the amount of personal attention preper to disposal, as demanded by law Lastity, the Binter Examinera-li-Dirk, as at present constituted, e-siate of three members, and no provision made under the present inest to supply a tempor vacancy caused by sickness, or other cause, with result that the absence of one other cause, with rults in an unevenly divided Board, and in the o

quent necessity for a rehearing. The absence of the members causes an entire suspension of business.

The enactment of Mr Curriar's bill into a law would an appellate Board, any three meml which would constitute a quorum, the prosecution of all applications on appeal would be expedited, and elimination of one appeal would mean the saving elimination of one appear would mean the saving we the laventors of one appeal fee, attorneys' fees and incidental axyeness. Lastly, one appeal in the Panish Office instead of two would give greater stability the decisions of the office tribunals, and would affect the decisions of the omce tribusta, and would not obvisia any want of agreement that has at times isod in the past between the decisions of the County of th

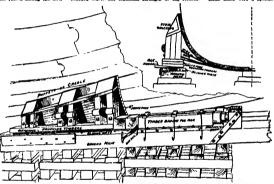
it for the consideration of Congress. The nat n, as a whole, is in favor of the mean

The value of the measure will be appreciated a and value of the measure will be appreciated we consider the manner in which the Patent does its work Each of the forty-two examining along deats with a small! dist. ais with a apecial class of inventions.

Board of Exam in-Chief, consist three men at presinventions from all at tire range of mech cal arts, chemistry, electricity, and the ifke The member be experts in all of these widely diverg-ing fields of activity They must inform themselves upon all these classes of inventions as they come be fore them They are enpposed to have a epecial knowledge of all the legal points which are likely to be which are likely to se involved in the ap-peals on mechanical questions. They must aludy up and inform able to explain the technical point at evenical point at issue Obviously, in order that these men

order that these mee the control of may keep up with the Beamines probably requires three to fear months! Elemanicars probably requires three to fear months! fime. The bill in question saves so much time in getting a case through the Patent Office. It practically provides six men to do the work that three are most trying to do, without any additional cost.

trime to do, without any additional cost.
At the prespect time, the same work is done over
twice in the Freinz Olice for an every good passage.
The theory of the present course of aspins in that
the control of the present course of aspins in that
the control of the present course of aspins in that
the control of the present course of aspinsters,
the control of the present course of aspinsters,
the course of the course of the course of the present
that person. It is impossible for the Compressional of the
Patents in present, its girl, date, aspide-principle, its



LAURCHING WAYS AND CRABLE OF "FLORIDA" BEAR THE BOW

ing timber fails to hold the vessel. It parks with a loud report, and almost invariably the ship starts, slowly at first, and then more rapidly, for the water Occasionally a vessel will stick and must be given ol. It parts with a Occasionally a vessel will stee and must be given a start. For this purpose, four heavy ramming tim-here are taid in possition abutting against the end of the launching ways, with phéraulto jacks interposed between them, and boxty timber abottments. Should the ablp "hang." a brief operation of the jacks is gen-erally sufficient to start her

ring the Rumber of Appeals in the Palent **at** Mr Frank D Currier of New Hampshire introduced on January 21st, 1910, a bilt the principal purpose of which is to expedite the granting of patents in the or which is to expedite the granting of patents in the Patent Office, and to aliminate one appeal in the office in his last annual report the Commissioner at Patents recommended such legislation and advocated a meas-ure which would combine the Commissioner, the Pirst Assistant Commissioner, the Assistant Com and the Examiners-in-Chief into a single app unal, any three of whom shall constitute a qubrum, to which all appeals chall its, whether from the Primary Examiner on from the Examiner in Interferences, and from which appeals would lie to the Court of Appending the District of Columbia.

or tan District of Commiss.

Thefer the present patent law in as perfe cases an appeal life from the Pricary Examiner to the Beard of Examina-in-Chief, then to the Commissioner (the Piret Assistant Commissioner or the Assistant Commissioner or th missionar), and from his decision to the Court of Ap-peals of the District of Columbia. In interference cases, the course of appeal from the decision of the Examiner of Interferences is the same. This course



The Company of the Company of the Company of the Company of the American Commissioner, and he has been have been dear the Company of the American Commissioner, and he has has he have the shalp of the circle. The situation of the Beard of Chamilton-1-Chief, the only chance the Beard of Emmission-1-Chief, the only chance the Beard of Emmission-1-Chief, the only chance the Beard on a case is after bearing the sugmented that the company of the Company of the Samman of the Samma

A PERSONEWAL OIL GUSHER.

The largest oil gusher in the history of California. The largest oil gusher in the history of California, and perhaps the most profitable in the world's history, is the Lakeview in the Maricopa oil field, forty miles southeast of Bakevafield, Cal. The gusher spired to spout on Tuesday morning, March 18th, and, war for a period of eight hours in which it banded up' on March 18th, when it hurst forthe of ign own accord like a worland oil, the well flowed continuously up to March 18th, werently as flow or cardinously up to March 18th, everything a flow of cardinously up to March 18th, everything a flow of march 18th, and the state of the second of the second of the property of the prop Sayou narrols of oil of its gravity became each 24 hours, as measured in the run-off from the sump hole through a ditch in which the oil runs to a repidly built pipeline Blance that date the flow has continued at the rate of from 42,000 to 45,000 gallons, and up to May 2rd it had delivered about 2,000,000 barrols

e marvel of the gusher hes b productivity During the two weeks following March 21st, 1910, more than one-helf million barrels of high grade crude petroleum had been collected from the grade crude perrocusin will he acrea the search to the country of the derrick, which, before the crown or top was carried away by the stream of oil, was 16 fort in beigh! The oil sands were surveix at 2300 feet, at which point is treamed on the crude of the country of the cou of feet in the air through the cigni inch chaing Arter the oil sands were struck, the well rapidly "drilled itself" to a greater depth. The well promises to keep spouting for many months to come

The well can be heard roaring for more than a mile. Spray from the gusher has been carried a dis-tance of two and a half miles, and hundreds of autotames of two and a half miles, and hundreds of auto-mobile have curried sighteers from Bakersheld to winsee the unique sight. The same brand for a dis-termined the unique sight. The same brand for a dis-cipation of the same sight of the same sight of the same sight of the same sight of the same brought hy small boys into Marteops. All efforts of the oil flow carried sway the crown or top of the descrike and fifteen feet of its uppermost executive, and the tremendous flow created a hung lake of oil descrike and finding the same sight of the describe and the marted of the same sight of the describe and the marted of the same sight of the describe and the same sight of the same sight of the describe and the same sight of the same sight of the describe and the same sight of the same sight of the describe and the same sight of the same sight of the describe and the same sight of the same sight of the describe and the same sight of the same sight of the describe and the same sight of the same sight of the describe and the same sight of the sam

From a money viewpoint the gusher is said to be the most valuable in the world history, far exceeting the famous Texas gusher in the Beaumont Sel ning the intuities in the Description tests, which caught fire and subsequently ran into sail water, for the owners of the Lakeview had netted by March 21st over \$300,000 from the oil, which is now being piped to tidewater from Maricopa in the San Joseptin valley to Port Harford on the Pacific count, a distance of 150 miles.

of the off from the gusher was in itself no To control the oil from the gusher was in itself no slight achievement. Shortly after the great stream annaed the drillers, three pumps with a combined capacity of 25,000 barrels delty, were started working at top speed, pumping oil ont of the sump-bole, and the oil so recovered was the first oil to enter the huge tanks built by the inde

nis.

The hig wail, which is one of the seven guahers

"brought in" in the Coalings and Midway-Maricope

position of California within the past month, is due

to the porsistency of a sing's man. A discouraged of fields of California within the past month, is due to the porsistency of a single man. A discouraged beard of directors, three days before the gusher was struck, devided to quit drilling. The order was given, but the superintendent conveniently farget it. He drilled 47 feet more against pensity of disminand, and the bit entered the oil mands.

the bit entered the oil made.

"To date all efforts to city the well have proved un-publing, and the oil is now runhing heavenward her.

It is an interesting that the lately the gravity.

It is an interesting that that lately the gravity of the oil has revere from 15° Bearman to 30°. This less bein, tajens to indicate that the oil is now being drawn lately, a force substitute of "one".

Scientific American

Correspondence.

WEIGHT DISPOSITION IN APROPLAUSS

To the Editor of the Strutting American
in your issue of April 39th Mr Godfrey assumes
that the center of suspension and center of thrust
are coincide', center of gravity low, and center of
resistance to the lateral motion in verticel rudder

In an aeroplane with perfect stehility the center of gravity should be low, the center of thrust below the supporting plane yet in the center of resistance ed motion and the vertical rudder below the to forward motion and the vertical rudder below the center of suspension yet at the center of resistance to lateral motion. In my monoplane the operator by shifting hie weight elightly can raise the inner wing in making the turn MORES FOATELIN

WEED-OTTING BOATS.
To the Editor of the RESTRICA MERICAN
1 bare been a constant reader of the RESTRICA
AMERICAN FOR, I think more than thirty year—lack
as far I can remember, anyway In the issue which
I received fatterfar, I moticed an illustration of a weed-cutting boat and a description sent by your Paris correspondent. While I do not know that there is a specific statement in the article that it is a new scheme rertainly one can only gain that inference from the

While I do not remember to have seen a weed-cut ng boat exactly similar to that one, they have been in ting boat mas in this country by many of the ice companies for many years. The Consumers' Company of this city, of which I was vice-president end general manager for a good many yeers, something like ten years ago hull a boat at their own works for this purpose and while a none at enter own works for this purpose and while owing to the fact that gasoline engines were not then so universally used as at present steam power was used for its propulsion and for the operation of the used for its propulsion end for the operation of the cutting kulves, yet its purpose was the same and it accomplished the same end and in my judgment was in some respects better than this French device. As I remember it, was merely built a flatboat about ten feet wide and forty feet long. We mounted the wheel at the stern, after the manner of Missiashpil River desembatts, instead of at the bow as in the French boat and we placed the cutting knives a the box They were about the same type as those used on mow They were about the same type as those used on most manifers and were operated by the same engine that propolled the boat. We mere! used a small origin the proposed of the same and the sa

and the other as pilot. It was arranged to cut to a depth, I think, of four feet I know of several boats of this same theracter used by various lee companies and I think in one respect they are very much botter than the French boat as they are very much better then the French beat as the cutting knives are in from, and the plick knows just what he is doing all the time and of course, he can run the beat very much nearer the shore was called the second of the time and cut the weeds out in very much shallower saler. The ranker, beat runs over the tops of the runshes, pushing them down possibly so that the weed cutting knives would not cut them at all Chicago, ill John Williams.

Bouth of Prof. Auguro

The well-known Swelish objected, Dr. Knut Ang strom, is dead. To the general public his passing will mean little, because he investigations were not or the character that attracted public attention. To the celement his death means and loss for is him physics has been deprived of one of its ablest investigations. Prof. Angartom was the second generation of a family distinguished for its aelectific researches. His father, John, achieved fame by reason of his splended father, John, achieved fame by reason of his splended born in 1807. He attacked at the University of Upsale, where he afterwed taught. Ill occupied a professorial chair at the time of his death. Angartom's fart pessearches were made in the field

earches were made in the field Angarrons and researched were made in the note of apoctracety. By means of the spectroblometer he studied the phenomena of absorption in the infra ed spectrum, notably for carbon monoxide, carbon dioxide, varies and cases. These investigations gave rides to an interesting controversy with Arrhenius. Water vapor, carbon dioxide and occore have ning. Water vapor, carbon cloking and come have a marked influence on the interpretation of our globe In effect, they partially hamper the radiation of the earth into inter-stellar space and thus aid in main taking the surface of our planet at a temperature compatible with the conditions of life with these fights up a basis, Arrhenius built up as ingenious

theory to account for the glecial period He supposed that the quantity of carbon dioxide contained in our atmosphere has increased since that period Ang etrom proved that Arrhenius' reasoning was veild only for carbon dioxide of almost infinite tenuity and that the possible variations of the tennity of carbon diexide in the air could not possibly have hed eny influence on the temperature of the earth

on the temperature of the earn
Angstron's name will be forever linked with the
study of soler radiation An instrument which he is
votted for the purpose of measuring this radiation
and known as the Angstrom pyrheliometer is now
widely used in observatories

The (pront Supple

The government dam surges the Sait Divor at Door tell, Arizone is neering compiction efter about six years of active work. The dem is excellently described end ifinatrated in the opening article of the corrun Suprement No 1794 by Edmond G kinyon in ac article entitled "New Methods of Polar Exploration the forth oming expeditions of i leut Witheli per and Capt Scott are described in detail as well as ner and Capt Scott are described in detail as well as other expeditions. The urrent problems of most in-ierast to those engaged in the branches of science essociated with marine construction are usually brought into high relief at the anneal meeting of the arough this may restrict the anneal mesting of the lastifiction of News Architects. In the present year this has been particularly the case. A summery of the lastifiction of proceedings is presented. The insigura tion of the Oceanographic Museum et Monaco took place on March 28th in the presence of representatives place on Merch 28th in the presence of representatives of the governments of Frence Germany itely, Spain and Portugal, and a greet gathering of men of sal ence of all nestions who were invited by the Prince of Moneco The museum is made the subject of en in teresting illustrated article Dr E E Barnard of Monaco The museum is made the subject on su-trecenting Huntarted article Dr E E Barard of Verkes Observatory has made a speciel study of the aurora. In the surrent Stretzsevt the results of his observations between 1802 and 1809 are presented On May 18th, et 5 P M eastern standard time Hail ley a comet will 1 sa directly between the sun and the earth sud its tall will sweep over and envelop the earth in this connection it is interesting to note that a miracle book of the sixleenth century mentions the plane 3 of a very large comet between the earth the page 3 of a very large comer between the ward end the sum and a phenomenon spinsrenity connected therewith. The circumstances of the passage as given in the work are published. Perhaps the higgest comet of the nineteenth century was that of Donall which appeared in 1858. At the time Charles Dickens was Relitur of Household Words in the pages of which magazine there enpeared an interesting article on the epipearunce of the comet—interesting because of its empt to present the phenomenon in a popula and else curious in the light of our more educated cometary knowledge. Visible Molecules Corpuscies, cometary knowledge Visible Molecules Corpuscles and ions is the little of an article in which the mod-ern theory of matter is discussed

1 Mabiliser for Aerophuses.

Righard has designed en automatic device for steadying the flight of an aeroplass in which use is medo of the invariability of the exist of rotation of a used of the invariability of the sats of reletion of a gyroscope For stabilifring an aeroplane however it is not necessary in here a gyrostat of great mess, act ing directly upon the sats of the ecroplane A small gyroscope, weighting only a few pounds suffices to cetablish electric contacts in the frame which conteins ii By means of these contacts currents are sent through motors which operate the steering organs of inrough motors when operate the streving nigans on the aeroplane. Two motors are required for this pur pose but they may be very small and light because they at upon the rudders by means of tevers. Reg mard has not yet had an opportunity to apply his in vention to a real aeroplane but he has submitted to the French Academy of Sciences a model of an act we

the French Academy of Sciences a model of an arm plane about three feet long resting on a low which contains a gyrostatic stabilizer. When the system is inclined in any way the steering organ, whose four ion it is to restore the exist to its original position, is at once automatically set into motion. What One Firm Pays for Patents

What One Firm Pays for Pacets.

A recent report of the General Electric Companionaring the period of the eleven months ending December 31st, 1990 contains some remarkable figures During the fixed year the company paid for pain sind patent illigation the soun of 3904 507 with sum in not counted as on asset but is charged over to prent and loss. All the company a voisable justices from these and good wills stand in the lasience above at a nonzinet visuation of one deliate.

Mr Richard Blees en inventor who did much to aprove mechinery of verious kinds, died recently at Improve mechinery of verticus kinds, died recently at Richmond Hill, Long island, at the ripe age of 5' years. He patented the Culter swith and the first exaling ladder used by the New York Fire Depart ment. Hydraulic water pressure systems for sky acrapers and improvements in sewing mechines are THE PARTY OF THE P

THE MANUFACTURE OF TWINE

BY DAY ALLEN WILLEY

What is generally known as hemp twine, used in such enormous quantities for various purposes, is manufactured from two varieties of ther known as Manile and Sissi Needless to say the first named comes from the Philippine Islands forming one of the principal products of this possession of the United Shates while the Shate of Yustan contributing the larg manufactured can be gained when it is stated that such wear no less than 125,000 tons are shinned from e city of Manila ment of it coming to the United States

The Aber from the Pkilippines is obtained from a

varted into fiber. This is done by the usual method of decortication. The material is fed into the receiving hoppors of the mill by means of an endless con-veyer, the leaves being hild upon the surface of the conveyer aide by side By means of toothed wheels they are cut lengthwise into shreds. In this state the they are cut lengthwise into shreas. In unis state the material is passed through mechanical cleantry which remove all of the pulp. Next the fiber passes out of the decorticator and is carried to yards adjacent to the mill; where it is hung upon itnes end dried by exposure to the heat of the sun. This process con ed, it is pressed into bales of conveni is then ready for abinment to the United States. airendy stated, the preparation of Manila fiber is done

almost entirely by hand, and before being export ed it is also dried in the snn, the long poles, how ever, instead of rope or wire as at the Moxican



species of the banapa family, which attains a height of fifteen or twenty feet. The stems of the separate leaves grow in a close cluster form leaves grow in a close cluster form ing what appears to be a solid tree trunk, to the height of ten or twelve feet, where they suparate and hranch out like the limbs of an ordinary

Type of spindles used for convarting

The natives cut these stalks off near the ground removing the leaves from the top of the stalk, leaves from the top of the stalk, then expanding the stum and removing the rule from the filter by repeatedly draw high it arrows the edge of a dull liked pressed on the fact of the stalk of wood. This primitive has not a yet given likes to modern meaning the notal stalk of the
fined to the mountainous districts. After the fiber has been dried it is packed in convenient sized bun dies and brought down to the coast villages where it is purchased by exporters, who sort the fiber and press it by machinery into bales convenient for ship-ping. These bales are protected by mattings works. r plaited from rushes by the natives, and ere secured by ratten bands

by ration bands
The Hencequen plant furnishes the Sisal Sher which
le brought to this country The plant bears a re
markable resemblance to the well-known century
plant and is frequently mistaken for the latter on plant and is frequently mistaken for the latter on account of its appearance. As it forms one of the principal products of Yucatan the Sizal plant is cul-tivated on large plantations, principally by Indian labor. The young plants on these plantations are set out in rows about ten feet apart. About the 5fth or out in rows about ten reet apart. About the min or sixth year the plant is smill ently matured, so that the under and larger feares are cut, and the pulp re-moved by decortication, leaving the fibers to dry in the sun, they are then bailed ready for market. The plant continues to grow and produces about a dozen mature leaves each war At the end of a period ranging from fifteen to twenty years the plant dies, and is replaced by a young one
The method of gathering the Sissi and shipping it

ine mentou or gathering lies Ness and shipping it to market is much wore setematic than the process employed in the Phillippines, for nearly sti of the Sleat plantations have transveys extending through the Henequen fields, so that so fast as this curious hervest is gathered it can be loaded directly on can and drawn by mnles to the factory, where it is con-

twine of commerce is performed by practically the same process The interior of the modern twine factory is somewhat similer in appearance to that of a cotton mill, with the exception that some of the machinery ntilized in the let is due to the fact

that less care is required in the preparation of the fiber for spinning, required in the preparation of the fiber for spinning, asince its appearance usually does not increase in the value of the finished product. As is well known, the value of the finished product. As is well known, the most elaborate apparatus installed it includes the most elaborate apparatus installed it includes the opining and excitating machina, by which the material is cleaned from dirt and other foreign particles. As the fiber is not a mass of that like raw cotton, this mechanism is not required, nor is it necessary to form it into both preparatory to carriegg in the modern (wite mill, however, the fiber is passed through mechanism which is somewhat ariginate to the carding of the conting of the continuous (whe mill, however, the fiber is passed through mech-enium which is somewhat similar to the carding en-gins and performs the same duties, disentanging the fiber by means of revolving cylinders provided with cards which are suitable for treating such coarse ma-terial. When carded the fiber is drawn into a condnit, through which it passes between calender reli-ers and emerges from the machine in a course strand. It is then coiled in large heaps either upon

movable racks or the floor. This is the first process in preparing the hemp—for such it has now be-come—for spinning, but before being conveyed to In preparing was some, we said it has now so-com—for spinning, but before being conveyed to com—for spinning, but before being conveyed to finishing meetine. This combines in part the draw ing and subhing frames of the cotton mill, so that when the material emerges from it, the strand has-been considerably reduced in size and is eligibily twisted, enabling it to be coited in cans, from which it is fed to the spinning framine while the which it is fed to the spinning framine while the which it is fed to the spinning framine while the this fiber especially, it is an amountle in it comes from as than modern self-exciling mechanism, and go more human labor is required to convert the silved per modern self-exciling mechanism includes of many factors of yars and thread from the ordinary cotton. The twins spinning meachine included drawing rolls from them being invited by the action of its spitching from them being invited by the action of its spitching from them being invited by the action of the spitching from them being invited by the action of the spitching from them being related to the contraction of the spitching from them being invited by the action of the spitching from them being invited by the action of the spitching and the contraction of the drawing rolls.

the movement of the drawing rolls.

As fast as the twins is span it is sise wound on a large speel or bobbin the latter being taken to the bailing machine as soon as it is filled with the twiner The bailing machines are sise automatic in their operation, not only winding the bail from the bobbing operation, not only winding the bail from the bobbing but discharging the finished belli automaticity whose it has reached the proper dimensions. Those ma-chines are salculated to wind bails weighing five pounds each where the twine is need in connection with binders and other agricultured machinery, the balls being parked into cases holding ten rach

At the McCormick plant, which is illustrated in the accompanying engravings, several grades of hemp twine are produced, one of which includes the mix ture of Mexican and Manila fiber, as this is found to be very durable. To show the difference in the weight of the material it may be said that a pound weight of the material 11 may be said that a pound of such twine contains 800 feet. The twin- made on tirely from Manila is slightly finer and averages 640 feet to the pound, while the Sisal is the coarsest, averaging 600 feet to the pound.

Educating the Permen by Rel1.

27 if 4 coarter.

California sees a way to solve the food problem by educating the farmers.

Sha believes that the farmer is never too old to



Bales of twine ready for shipment

THE MANUFACTURE OF TWINE.

She siso believes in teaching the young to be farm-

Accordingly, the State maintains a college of agri-culture, a university farm, polytechnic achool, United States experiment stations, etc. 5

states experiment stations, etc. 1.

Now sha proposes to introduce the study of agriculture into the public schools of the State.

A embatantial beginning in this time has already been made in the catablishment of the study in the

high schools, later on it will find a place in the

nign scroots, later on I' will find a place in the primary and grammar schools.

Then California has its farmers' club, grampes, and farmen' nulosa scattered all over the State, and these organizations exercise a large influence upon the edu-cational thought of the day

cational thought of the day Every year some hundred or no barm insellmen are hald in various parts of the State and reach annually between 20,000 and 35,000 farrance. California has the best originated horizontaged some

Scientific American

mission in the world, comprising a central office and State insectary at Sacramento and a quarantine de-partment in San Francisco.

ariment in Ean Francisco.

Each county covering a horticultural section also has amoin county covering a horticultural section also has its own local commission, inspectors, etc, while the fruit growers hold two State conventions annually These all wield a strong educational influence and add largely to the sum of farm knowledge in the State

But the latest and most striking feature of Cali fornia's campaign of farm propagands is the so-called "Agricultural and Horticultural Demonstration Train."

This train is the joint work of the California College of Agriculture and the Sonthern Pacific Company, the one amplying the exhibits and corps of lecturers and

This led to the organization of the "Agricultural and orticultural Demonstration Train" Horticultural Demi

And it only needs a glance at California's industrial statistics to convince one of the truth of this charge

of wasterul husbandry.

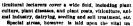
California thirty years ago was one of the leading
wheat-producing States of the Union in the year
1879 its wheat output amounted to not less than 1707,800 tons, in 1804 the annual product of wheat had
dwindled to 465,028 tons, a ahrinkage of more than

seventy five per cent. California was forme orly a great exporter of wheat California was formerly a great exporter of wheat and flour. In the year 1882 she exported not less than 1,138,031 tons of wheat and 919,598 barrels of flour. In 1904 her exports of wheat had dwindled to 54 381

of wheat snnually in order to keep her mills running, and And all a result of poor

of weat and dwindled to be say tons and flour exports to 882 485 barrels. To-day both the ex-port of wheat and flour are nil and the State is compelled to import a million dollars' worth her flour up to standard grade

farming, as is ovidenced by the fail of the avorage annusl yield per acre of wheat from forty to less than fifteen



portance of restoring the lost fertility of depleted soils portance of restoring the lost ferility of depleted soits and the maintenance in their composition of that vital element known to agricultural sciences as hu mus, all of which has a direct bearing upon the increase in the production of food-staffs sufficient to supply the demands of a constently increasing population

Pire Control in the National Porcets

Probably one of the best things in the line of an agreement has just been signed by the Secretary of Agriculture and several railroads whose lines run alongside of the national forests. Two of the largest and longest roads in the Northwest (the Great North ern and the Northern Pacific) have right of way through some of the richest timber districts in the

ern and the Northara Pacific) have right of way through some of the richest imber districts in the West and this agreement is of grest benefit. They have in view both the reduction to the lowest point of fire risk from the operation of the railroads and joint action by the Fornest Service and the rail roads to fight all free which may start along the roads to fight all fires which may start along the lines Both companies have agreed to clear and keep clear of inflammable material a strip of varying width, as conditions demand, up to 200 feet beyond the right of way, and to provide all locomotives which do not hurn oil, with snitable spark stresters and other

standard equipment to prevent the drop-ping of fire An effort will also be made by the companies to so operate their en gines as not to cause fires.

gines as not to cause fires.

In fighting fires the railroads and the Forest Service will co-operate closely Noti fication will be made promptly to the Forest officers of all fires discovered by employees of the railroads Telephone employees of the railroads Telephone wires to make this possible will be put up



demonstrators, and the other a fully equipped railroad train comprising three exhibit cars, a lecture car, a sleeping car and diner, all absolutely free of cost to

The work of the train is arranged in a series of annual tours, covering all the leading agricultural and horticultural sec-

Each series consists of five septours, each tour covering from 500 to 1,000 Uses
mlies, and from twenty to twenty five stopping places. The work of the train begins in the late fall and ends in the late spring It does not specialize like the demonstration train of the Bast but covers all

the leading lines of agriculture and horticulture
Its corps of lecturers contains some of the ablest
members of the faculty of the College of Agriculture, and the president of the university, Benjamin Ide Wheeler, frequently joins the train in its course, and

ment The Southern Pacific Company very candidly admits its own interested motives in the premises, and frankly explains that it discovered a serious failing off in its local tonnage, and when the matter was in vestigated it was discovered that the shrinkage was found in the item of farm produce

They consulted their local freight agents as to the underlying causes, and were told that the principal cause was an exhaustion of the soil This was hardly believable, and the company con

This was hardly believable, and the company con-suited the soil experts of the College of Agriculture who denied the theory of exhaustion, but explained that the soil had been depleted by a practice of poor cultural methods.



Combing out the hemp preparatory to shipmen

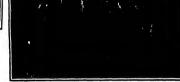
It is this era of wasteful farming that California desires to put a stop to, and hence in augurates her campaign of agri cultural education

The "Agricultural and Horti-

The "Agricultural use notes that the continual Demonstration Train" is developing unlooked-for efficacy it was originally intended of for the enlightenment of the present generation of framers, but its inducate is being carried beyond that limit, it is being brought to have more the states generations and the young folks using carried beyond that limit, it is being brought to bear upon the rising generations, and the young folks are fully as much in evidence at the lectures and dem-onstrations as the bider ones.

At each stopping place for lectures the local schools of all grades are dismissed and the pupils allowed to

At each stopping place for lectures the local schools of all grades are dismissed and the pupils allowed to attend, a privilege that is evidently appreciated by all They crowd the demonstration cars and lecture car. attend open-air lectures, lectures and discussions in (tend open-air lectures, lectures and discussions in sighboring school rooms, public halla, and opera-ouses, and are found in attendance whether the athering be in the daytime or in the evening. The subjects dealt with by the agricultural and hor-



Windles the material tate capitars for spinsing.

by the Forest Service using the companies' poles where this is possible. Warning whistles will also where this is possible Warning whise

be sounded by incomplies on occasion.

Forces of fire fighters will be assembled on the outhreak of fires, and will be made up of Forcest officers,
railroad employees, and such temporary labor as can
be gathered by either. The coat of fighting fires which
attrivithin 200 feet of the railroads will be borne by the companies and of all others by the Forest Service, unicss it is shown in the first esse that the railroads ere not responsible or he the second case that they are responsible for the outbreak of the fire. It is the intention of the Forest Service to patrol the rights (Concluded on page 427)



Mantin home; the raw majorial as it comes from the ship.



Preparing the homp for spinning



DAMMING THE MISSISSIPPI

BY W. P. GREEN

Excelled only by the monator dam arous the black of Nile River, the greaters equiparting for it is the barieful River, the greaters equiparting for it is the barieful River, the greaters equipartial River was the Mississippi at Rockells from the point from which Colloses wit started the river journey to the far was exversal years got A huge dam to being hittle access the Mississippi at the foot of the rapids with the the north of Kechnik, and the stored energy of the river is to be used in ga acrating over 200 and sterile alternative will be distributed throughout the Middle West, the first long distributed throughout the running to 81 Lonis 170 mississiphility to be developed in one winder contract. The bed of the river at this point affords an excellent rock foundation for dam will be built of referred concrete, and over 160,000 larreds of eccuent, and 7,000 tons of steel will be required to the construction of this against

The dam, including abutments, will be 4 700 feet

of 43 feet. On top of the apillway will be placed 118 steel flood gates, 30 feet wide and 11 feet high, supported by concrete piers. The piers are to be built integral with the dam, being cerried down to bedrock on the upstream side Thay will support any another higher, from which the gates will be operated by electric beings. Through the manipulation of these gains the water above the dam will be maintained at a constant local and all seasons.

Four fifths of the dam, the 4,600-foot section, will ketted in a straight line scross the river, breasting the current of the broad river. The balance of the am will be built appreximately parallel to the abores and at right angles to the math dam. This portion, 100 feet long 121 feet wide and 123 feet high, will be excussed by the power house. The substructure, so the property of the property o

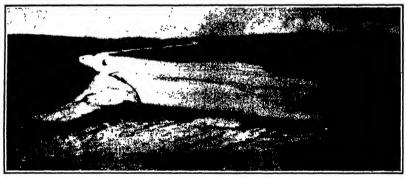
the power house, will be the revolving parts of the generators.

generators. To keep fonting ice and logs from antering the power house, an ice fender will be built upstream from the upper sed of the power house, curring in toward the shore. This will be 2,800 feet long and

built of concrete manoary.

The construction of the dam will entirely destroy
the government canal, built to carry shipping around
the rapids. This canal pay consists of three locks.
In its place a single large lock will be built. There
will thus be substituted for the canal is lake of deep
water over a mile wide at the dam, and of mike long.
The government has given permission to built die dam,
and it price for all ind ownflowed as the result of the
cregition of the reservoir.

a fair price for all land overflowed as the result of the creation of the reservoir. The construction of this gigantic river project is under the direction of Hugh L Cooper of New York city. The work of excavation is well under way on



This hape structure, over a mile in length. Is being built across the Mississippl at Kockuk, lows. The dam, which is broadly similar to the Associan dam across the River Nile, is provided with 160 food gates to control the height of the faced. A late 40 miles long will be formed and bifunately EQUID electric horse-power will be prevented in the power house shown at the laft of the dam.

THE WINGE DAW WINGE IS BRING BUILT ACROSS THE WISSISSIPPI

iong, or seven-eighths of a mile. The spillway acciton will be 4,400 feet in length. The dam will rise 37 feet above the river bed, and the base has a width

power generating units each consisting of a vertical steel shaft, carrying on the lower part two turbines, or water wheels On the upper part, on the floor of the Illinois side of the river, the project will be pushed as fast as the material is delivered at the site

The Commographic Museum of Monnes,

The Oceanographic Misseum of Monzo was form ally opened on stack 38th, 18(1), this founder, Prince Albert I of Monzo, in the presence of representative of various foreign government. The celebration is indeed a pyrotechnic exhibition and an alticurrical augustant in the beautiful lay of Monzo, a gial augusta in the beautiful lay of Monzo on a gial and the restriction. The men museum, which is also a indoprator, is connected with the Oceanographic Institute of Paris and both institutions, with an audorement of four million fraints that the company of the control of the million fraints and fraints and fraints are control to the control of the definition of the administrative council of the Institute, which in cludes among its members of President Loubet and the physicistic distlete and Beyenevel The direction of the estentific work is confided to an intronational committee for it was Prince Albert's design to form an institute and a infortation in which is the concept of the Institute were inaugurated in 1905, at the Concept of the Institute were inaugurated in 1905, at the Concept of the Air of the Concept of the Seaton of the Seato

The Occasiographic Museum of Monaco, which has already received the popular name of the Paince of the Sas, is built on the flank of a steep cliff at the edge of the sea. On the water side the huilding is 256 feet high, while the haight of the main façade on the land side, is 148 feet, the difference being due to the

stope of the citi The length of the huilding, parallel to the water front, is 10 feet. The cond of construction acceeded \$1,500,000. There are only four atorises and the rooms are very high, large, and we'll light the two lower stories which are partly underground, contain the squartime and shorsoriers, while the upper stories are devoted to the subbillion of sounding and other apparatus, and of the rich and varied collections of deepees faune and flore which represent the result of a quarter crutury of exploration Prize Albert has also placed a small steamer, the "Eiden" at the disposal of the Museum

a the disposal time in interests. The Prince of Monaco has made a scientific crules is the Mediterroad. Allanti or Arctic Ocean. The experience acquired with the "Hitmodelle," a sattling grached 200 tones, and afterward with the "Princesse Alice I," an ansitiary to good use in the construction and equipment of the "Princesse Alice I," an ansitiary to good use in the construction and equipment of the "Princesse Alice I," an ansitiary to good use in the construction and equipment of the "Princesse Alice I," and any the base of the princesses and the princesses of the princesses of faunt, form, and, mud etc., at very great dispitus. A great part of this apparatus was invested and constructed by the Prince and his assistantic.

This cases of the Manasum contain proposentatives.

The cases of the Museum contain representatives of all known deep-set fanns. Many of these specmens are interesting even to the non-scientific observer because of their strange forms, beautiful colors, and peculiar organs of sight and touch.

and peculiar organa or sight and touch.

These occanographic explorations and collections
also possess great practical value, in addition to their
scientific interest. Most edible fishes feed upon the

piankton or mass of small animal organisms which are waited hither and thither by even feebla ocean currents.

The explorations have proved that the plankton moves in a manner dapendent on the season and tocality. These migrations appear to be governed by complex laws, the knowledge of which, as it is grad usliy devaloped, will be of great value to the fisheries, especially to the steam fisheries, as the fish follow the plankton

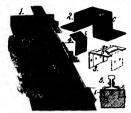
position of the Georgian and the Georgian and the Georgian and the Georgian and February and Feb

The Electrical World remarks that in a report submitted by the chief signal officer of the Ostical States army to the Escender of Was, it is signed that there are now in the army service a tight of 2 states of the other strength states, of which 13 was in the United States, 1 in Alaska, is the Prilipping plannin, Journal of the Company of the Compan



MAY DE TOTO

To prevent the destructive hammaring of the rails when depressed by the passage of a train, a new con-affection has recently been designed to furnish a more stantial support at the rail joints for them



IMPROVED BAIL CONSECTION.

creates in providing timbers or the running longi-tudinatily under the exitia at the joints. In addition to this, a number of very substantial mealitic flatest-ings sever to clamp the rails inhighly in position in usually the case that the joints of a railroad are arranged to come between and hot on the ties and heavy flabplates are depended upon to support them. The construction here liturated is intended to them. The construction here liturated is intended to them. The construction here liturated is intended to points. As shown in the accompanying ourse, any depressed, and on them is laid the longitudinal timber B. The last is clumped down to the litural by moran of a metal fratening C, which is aboven in full in Fig. 2 This is substantially of form, and may be remade 3-modity piece. It is preferably monthed has to remain the construction of the construction of the terms of a metal fratening C, which is aboven in full remains a secure of the construction of the construction of the flat points. The construction of the construction of the remains and the construction of the construction of the remains and the construction of the construction of the remains and the construction of the construction of the construction of the remains and the construction of the construction of the construction of the remains and the construction of the construction of the construction of the remains and the construction of the construction consists in providing timbers or ties running long integes are secured to the time by metha of spines in the control of the control and also increase the safety of the railroad ventor is Mr Henry Grass of Alvin Texas.

PRECE POST ANCHOR

A patent has recently been granted on a noval method of supporting a tence post, so that it will with stand excessive strain. The construction will be especially useful for anchoring corner posts. The device i tached to any post in our lituatration, we show in Fig 1 the construction applied to the ordinary fence



post, while in Fig. 2 is shown the construction need for corner posts. In both illustrations the post is designated by the letter A. At the bottom of the post is an anchor plate 2, which at one end is fastened out to form a blade of The opposite and of the anchor plate is doubled upon itself to receive the lower ced of a diagnosi larce 2, the upper end of which is botted to the post. An angie brace 2 is secured to the opposite side of the post and connects it to the anchor plate B The spikes which pass through the anchor plate are long enough to be driven to a conancory pasts are long enough to be driven to a con-siderable depth in the ground, and serve as additional means for prevanting the anchor plate from sliding out of position In use a trench is dug at the point where the post is to be erected. The trench is just wide enough to receive the anchor plate B, and the hisas O of the plate is driven into the undisturbed ground at the end of the trench, thus affording a firm suchorage. the end of the trench, thus affording a firm anchorage.

Thereaftr the post is erected on the anchor plate and
the braces D and E are bolted fast. For corner posts,
the anchoring device to used in duplicate. The blades
C of the anchor plate are driven into the ground at the or plate are driven into the ground at the side, where there will be a lifting strain imposed by the tension of the fance wires. The inventor of this anchoring device for fence posts is Mr Julius Laux, of

AMMONIA PURIFIER FOR REPRIGERATING PLANTS. AMROSTA FURIFIER FOR ENTRIPERATING FLATTS.
A recent patent discloses an improved method of purifying ammonia, so as to render it ashydrous in rerigerating plants. The object is to produce a high grads of anhydrous ammonia continuously while the compressor is in operation Au apparatus is provided which is connected in circ uit with the compressor and condenser and removes a portion of the heat from the compressed ammonia so as to condense the oil and water vapor and permit dry or partially cooled hnt uncondensed ammonia to be delivered to the con-densing coil. In this way the amount of couling that



APPARATUS FOR PURIFYING AMMONIA YOU

is required in the condenser is reduced. The passage of oll to the condenser by revetted sud the ammonia is condensed superated, so that only pure anhydrough ammonia is delivered to the expansion vaity. The apparatus comprises two bolders or drawn A and B within are consected at the bottom by a pipe C. The drawn B is preferably raised above the drawn A the compressed ammonia enters the drawn A, through a superated propersion of the drawn A, through a superated propersion of the drawn A, through a rompressed ammonia energy ine grain a, tarvogs a pipe D then passes through one or more connecting pipes E to the drum E after which it passes out through the pipe F The cooling system consists in a pair of water chambers O and a pipe H, connecting the top of the water chamber in drum R with the bottom of the chamber in the drum A. The water passes through the cooling system in the reverse direction to through the cooling system in the reverse direction to the flow of ammonia through the apparatus. The iemperature and rate of flow are so controlled that there will be no condensation of ammonia in the gas holders, but all the oil and water vapor which may be carried along with the ammonia will be condensed. be carried along with the ammonia will be condensed in these holders and sercumulate in the lower portions. If the valve in the pipe O is opened, the oil and water will flow lint be bottom of the drum A and may be drawn off at that point. The object of letting the pipe from the compressor pass up through the oil and water in the drum A is to best the oil and thus pre-went as far as possible the loss of ammonia. The investor of this apparatus is Mr Lawrance Wagner of Missouri Avenes and Missouri Pacific Tracks. edalia Missouri

CONVERTIBLE BOAT AND TENT.

OSSYMMINES BOAT AND TRNT,

Por the benefit of campers, hunters, and the like, a
folding tent has recently been devised which may be
packed late a very small compass and which may also
be montered into a canvas boat. Our illustration
afficing the device in its two forms, partly broken away.

to reveal the framework. It will be observed that the upper portion of the tent comprises a pair of lasy toggs 4, consected by rowes hers B. Howe are supported on four posts indicated at C and D, and the structure is resolved with the property of the structure is resolved up to reside the means of a system of guy wires. Swung from the framework are a pair of bers E which support a hammock P. The upper portion of the tent frame is covered with water proof canvas, and in addition to this, there is a lower canvas section which may be fastened to the upper section by means of huttons, thus forming a sparlous tent, and the occupant can sleep on the hammock,



CONVERTIBLE BOAT AND TENT

while h is a decided improvement over unless the group with he a decided improvement over using the ground of a bed. When bracking even the posts of and D are withdrawn from their socket a not the lary longs are folded up, so that the entire framework of the tent may be placed in a small bag. To convert this framework into a boat it is extended and interied, so that the cross bars B form the bottom of the boat The large M of the humano k are, hooked to the frame-The hors E of the hammock are hooked to the framework at one end and fastened together at their outer cults to form a bossprit for the boat. The bossprit is braced by a pair of arms H which are hinsed to the cross but G It will be observed that the lary tongs cross for G. It will be observed that the fary tongs at J are cittaded to from carlocks and the posts C of the test are so constructed as to form care. The seat the test are so constructed as to form care. The seat seems A. The results of the test at a rangisted to the framework including it and thus forming a find both control care to the
INDEX SYSTEM FOR POCKET MEMORANDA
A patent has recently been grunted on an improved
pocket memorandum book, which is provided with a
movel indexing system. The first leaf of the book is shorter than the others and serves as a topic list, being ruled to allow of entering various topics on which notes are to be kept. The other leaves of the while notice are to be kept. The other leaves of the book ser cut with series of table as shown in the illustration the table on each leaf corresponding in number to the topics provided for in the topic link. When notice on a subject are entered on one of the 1 aves of the book, all the taim of this leaf except that opposite
the topic to which the notes relate are cut eway When a leaf is filled, it may be removed and filed away in a card index—it it is desired to permit the leaf to remain in the memorandum book after it has been completely filled the tab is partially out away s it will still serve to locate the feat but will not inter If will still serve to locate the leaf but will not finite fere with the thumb in resulty finding the next intundements in the same series. In this way the entire memandum book is so arranged that its matter it contains is always properly indexed, and may readily be reterred to whenever desired bur thermore the material is so placed and the leave-age so arranged that when they are removed and died



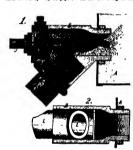
HERMANNE BOOK WITH BOYEL INDEX STATEM

Scientific American

an a card index no transcribing of the notes is neces mary The device should be of particular advantage to the modern farmer, horticulturist, gardener, or stock man, who must have some convenient way of collating and preserving the data of his daily work if he is to got a full measure of profit and satisfi tion out of his experience from year to year He cannot afford to trial his numbry with much impor-tant detail, and an claborate system of keeping a record dots not appeal to him. The pocket memo-randum book with topical index should meet his needs. The investor of this memorandum book is Mr. B. A. Bagby 1107 Brook Street, Louisville, Ky

IMPROVED TRACE SANDER.

l'icipred in the accompanying engraving is an im-proved track sander for use with locomotives. The apparatus is so arranged that two jets of compressed air are employed one of which is directed against the o sand box, serving to agitate it, while sand in the sand box, serving to agistat is, while the soluter arts to disharage the same confineously and smoothly Spe lat precautions are taken to prevent the nozzier from leving cinged with sand in our illustration line sand box is indicated at A. The sander canning of its auditantially of Y form it is threated into the sand box and hold in piace with a color half Alt the opposite and of the examine is a ping C, provided with an extension D constituting the provided with an extension D constituting the provided with an extension D constituting the contract of the examine is a ping to the provided with an extension D constituting the contract of the examine is a ping to the provided with an extension D constituting the contract of the examine is a ping to the provided with an extension D constituting the contract of the examine is a ping to the provided with an extension D constituting the contract of the examine is a ping to the provided with an extension D constituting the provided with an extension of the examine is a ping to the provided with an extension of the examine is a ping to the provided with an extension of the examine is a ping to the provided with an extension of the examine is a ping to the provided with an extension of the examine is a ping to the provided with an extension of the examine is a ping to the provided with an extension of the provided with an extension of the examine is a ping to the provided with an extension of the examine is a ping to the provided with an extension of the prov the horr is constricted to form a let opening, which communicates with a recess in which a hall P is placed in addition to this, there is an inclined jet pure u in addition to this, there is an inclined jet opening E. At the opposite end of the ping there is a sercen H which serves to strain the compressed air that enters by way of pipe J. In the other leg of the



IMPROVED TRACK SANDER.

Y-shaped easing is the pipe L, which leads to the point at which it is desired to discharge the sand Within the casing, and extending partially over the passage leading to pipe L is a shelf K in operation, when compressed air is admitted to the nexale tt forces
its way past the ball F into the sand of the sand box

A pertion of the air is directed backward to the jet opening E, producing a partial vacuum, which causes the sand that is agliated by the other jet of air to flow along the shelf L and thence be carried air to flow along the abert A and thenev oc carried down its discharge sipe. I the ball F prevents the constricted opening in the nozzie from being clogged with sand, and this constricted opening serves to reduce the little pressure by permitting its expansion past the ball F, so that a destructive sand hisst is avoided thereby. The inventor of this improved track sander is Mr John Henry Watters of Augusta, Ga

BRIEF NOTES ABOUT NEW INVENTIONS.

The singing sign which has been recently placed in front of a Denver business bouse is a visual as well as sudible means of altracting the attention of passers by The particular sign referred to displays passers by The particular sign referred to displays the word Dimilets' and is of the electric flashing type The illumination of one letter follows the other, and as the lamps comprising each letter are finahed, a wooden hammer sirikes one of a group of orchestral There is a different bell for each letter, and mes represent a complete octave. The comohimes the chimes represent a complete octave. The com-bination of sounds may be varied at will with but lit-

The illuminated elevator threshold is a new to prevont what is a quite common form of elevator secident. The elevator attendant, making hundreds of sions in the course of a day, is not always enabled to bring the car to a hait at the exact floor level, and a very slight variation is sufficient to give the passen ger a joit if not more serious injury. The floor of the car being held an inch or two above that of the building is likely to trip the unguarded person about to enter the car, while persons stepping out are liable to be thrown down. The latest method of avoiding this is the insertion of a pair of plate glass lenses in the metal of the threshold, with an incandescent lamp under each. These are kept in operation all the time the car is in use. The lamps are supplied through the slevator cable in the same manner as the overthe sievator cable in the same manner as the over-head immps. This device has been tried with eminent success in some moving-picture establishments, where the rear seats are slightly above the level of the alsie

floor

The jobhing carpenter moving around from one place to another, and locating for a five days at a wife in a continuous continu been made, so that they may be readily packed up and carried from place to place. The legs fold over on the back of the trestle when not in use and when being transported, and in this form they are very compact. Being of angle iron, the treatle is not heavy and is almost everlasting

ODDITIES IN INVESTIONS.

HAT FASTYKER.—The recent agitation against long hatpins has set a Yankee inventor to thinking. He anapular lines see a statege treatment to minimage rate has arranged a hatpin which has no exposed point and which does not have to be removed from the hat, but which may be operated to engage the hair by giving it a haif turn. The hatpin extends from side to side of the crown of the hat, and is provided



A WOVEL TYPE OF HATPIE

with a series of books or grapples sharply pointed at whith a series of notes for grappies sharply pointed at the ends, so that when the pin is turned they will hook into the hair. Whether the hat fastener has been tried in actual practice we do not know but it seems as if thore would be considerable danger of entangling the hair in the curred hooks.

entanging the hair in the curred hooks Device you beaving on an Envision Organica. An inventor does not have to go far afield for object upon which to exercise his inventior faculties Breen in the most commonquae matters of everyday life there is room for improvement. Take, for insuch these is room for improvement of the property of the control of removing one's overchose the usual way to be the control of the other foot is most awkward, to say the show off the other foot is most awkward, to say



DEVICE FOR DRAWING ON AND REMOVING

the issat Recently, an inventor has devised a little attachment for the cana or umbrella, whereby one can atand firmly on one foot and steady limself with the umbrella while rumering the overshoe by pressing the lug at the back of the overshoe against the attachment on the umbrella. The inventor has previded a



more sinborate sevice to hold the overshee in place while directing it on. The lug at the heal of the owner hose is so formed that it can be engaged between a pair of jaw clamps, one of which is fixed while the cause, and the control of the case is a root, and running from the merable jaw to within a convenient distance of the head of the case is a rod, which may be lifted to release the jaws. Luximous Guy Sturims—When using a gum in the dark of deep twillight, it is very difficult to secure accurate aim, because the sights are invisible This difficulty has frequently been superienced by sentries,



LUMINOUS SIGNES FOR TWILIGHT SHOOTING.

who should be this to cover an approaching enemy with accuracy, in order to secure their own safety as well as that of the camp To enabla this to be as well as that of the camp To enable this to be done, an inventor has recently evisited a gun in which the sights are luminous This is effected by measu of a pair of small olectric lamps lighted by batteries placed in the stock of the gun The sectional views in the accompanity gun of above hos hamps are ar-ranged. The sights are formed with prima, which at their lower ends communicate with chambers in which the lamps are located. The lamps are lit only when the trigger is partially pressed, so that it is not necessary for the sentry to expose his where-abouts until he is ready to fire. The sights are of such a nature that they may be used in the daytima with the lamps disconnected, a switch being provided

for opening or closing the lamp circuit
Support for Electrically Heaten Flatirons Surpose ros kircrascatx Harros Patinosa.—An opera support has recently been invented for electrically heated flatfrons It is so arranged that the current is turned on only when the iron is on the support. The support constats of a metallic base provided with legs of insanisting material and supor which is mounted, in inclined position, a plate of siate On this ten factors in adopted to be supported, so that the head of the flatfron is adopted to be supported, so that the head of the flatfron will alled down and bear against block of inceiting material at the crassing of the control of



SUPPORT FOR BEDSTRUGALLY MEATED PLATING

the heel. These are adapted to engage the cities when the tren is in position on the data. This completes the circuit frought the cells, and overse to heat the from As nows as the tren is removed from the span-ic circuit is bricken, and thorpy in no years, of charging or designation overshooting that is considered.

REGENTLY PATRICULAR INVESTIGUES.

TRACATOGRAPH INDEPENDANT A. I., COCAMAN TRACATOR TO THE MATERIA A. I., COCAMAN TRACATOR THE PROPERTY AND THE

Of Interest to Farmers.

Of Enterest to Farmers,
STX-HORSE DEAST MECHANISM—II
MESSAM, Kestland, and This invention has
reference to frart mechanism or draft gars making a number of horse or similar draft and
make in he stacked to a plow or other im
jetsent, and provides a construction which
gill equalize the leverage and pulling force ox
draft by its different animals.

office by the different animals.

GRAIN BYSEADER AND PREDICE A.

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GRAIN BYSEADER AND PREDICE A.

Stam to a device spiritual and present at the stamper of
cylinder (CHURN-W P 8 SENTENDAL, Salishory, N C In general the havealten may be defined by the control of the c

Of Coneral Interest.

Of General Interest.

COMPOSITY BAM STRIPTURE—W P.
FRANCIA, Pensacola, Pla Among the principal
objects her is to provide a construction
wherein is combined into treatle strength of
metal cornation with the inmubility of tax
soury, to provide a composite structure of
metal and messary win rely the metal ism
freptord construction or a carrying beam
freptord construction or a carrying beam.

Arreptor construction for a carrying bean INN-CLINDMETRIE—R. II Houses, New York, N. Y. This improvement comprished as line cilionater nurvided with a in-scope and a level associated increwith the titrecept being adapted to turn in a substantially written plane, and sevens including a venter and a level for measuring the xitum of inclination of the beleepop, from a given rial or longingry line.

Hiss.

REPAIRC FURNACE.—II W Hisson,
Philadelphia Da More particularly this in
vention relates to those furnace used in bis
smelling of sine sures. An object is to provide
a furnace in which the sine is fed in at the
top, which is kept closed by means of a top
of double constrution an arranged inlat an
ipper door may be upened and a charge fed
in whin the lower door is shift

Hardware and Tools.

Hardware and Tools.

TABLOK K--A M II he listrocken, New York N Y Fals involution relates to feeks having a main boil formed of basis smiles, such, for instance as shown and described in the Letters Visint of the U N, formactly granted to Mr Too Huycker The aim is to involve a public having both adder of the hasp notebod for engagement by Isa hooked months of a boil actional by Sec contribution.

Heating and Lighting.
HIGH ABBORNE FOR TUNGSTEN
LAMPS — R. LIWARTS and L. KLHIMARS, NOW York, N. Y. This invention is particularly useful in connection with electric limps on an impair may be a connection with electric limps or as impair may be a connection with electric limps and a connection with electric limps and a connection with electric limps and a connection of a part of book absorbing device for supporting the impairment of a part shock to the tunn, which might be otherwise transmitted from the ceiting or wall.

otherwise transmitted from the ceiling or well. CANDELARBUM—I Stoop, New York, N Y This candidatives is such as used in charries, shapels and distinct pieces where candles are last horrison continuous boom a complete con-graphic of the candle. The invasion resides purply, in the nature and form of the bobacter or equ while supports the candle. The con-pleted is such as to prevent the center.

shald Welltides

TRAP.—M. L. FRENCH, Onide, S. D. In this involves the inventors related to trupe for use in physicist insects, and regides more parties.

larly in a trap for files and the like, compris-ing apertured scroem adapted to entrap the in sorts, and so constructed as to permit of the same being restorably used on screen doors, window screens and like protections.

since being removably used on screen doors, wholever create and the protection. WASHIDOARD.—D Frunt, New York, N Y Western and the protection of the properties of the change in the properties of the change surface in fruity held therein. The board is 1000 MeV. The properties of the

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Prime Revers and Their Accessories.

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pipo

MAPETY-GATE. E. Kuancura, New York,

N. Y. This invention relates to matay gates,
suitable non-specially for use pipo cars and
similar railway vehieles, the more particular
purpose being to prevent persons from passing
from one car to another while the train is
rounding a curre, or at least to warn such
persons of Ibia danger.

rounding a curre, or at loast to warm agenprevious of list described by the list of
Rallways and Their Accessories.

TARNORURE HOLDSRIP —A WY-Examan, to This device in of book form, a few man and the second of th

are provided for enverying air under presents if it were, possible to transfer the withstillow care at transfer in the second of religions to the present of the provided of the photographic reversel could be greatly in the latter adds of attiture over and provided of the latter adds of attiture over and provided of the latter adds of attiture over and provided of the latter adds of attiture over and provided or the latter adds of attiture over and provided or the latter adds of attiture over and provided or the latter adds of attiture over and provided or the latter adds of attiture over and provided or the latter adds of attiture over a latter to be added to the latter arranged of the added by the latter arranged or the adds of the latter arranged or decided or the latter arranged or the latt

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NEW BOOKS, RTG.

REW ECCES, ETC.

RHIDDEN S DIRECTORY OF PASSENGER STRAMPASS London George Phillip & Son,
Lid, 1910 12mo., 387 pp Price,
\$1

1Ad, 1810 12mm, 287 pp Press.
This is very visibility back for all who not interested in any way in objuping. It alres a list of compared with life name of the versals under each their censes a directory of the control of the contr

Notes indicate from the term of the control of the control of the London
The author is to be congratulated on the pixel term of a city of the control of a city of the city of

silves are to risen. Frame Spanish Hailian will have been dead parpert of the state
pied for upward of five years, is pe the first time in Ragina Hieracture a complete record of the interration and divelopment of this writing machine. In the 200 pages nearly 800 machines are described with the aid of 200 illustrations—from the Mills typérriter of 100 years ago to the adoptation of typerriting to the near of wireless telegraphy. In this vol-ume the Biecket Lypewriter, invented by the late A B Brank, comes in the a proper share of a timution.

INSECT WONDERLAND. By Constance M Foot New York John Lane Com-pany, 1910 Price, \$1 25 net

pany, 1910 Price, \$1.85 net.
The kind reception gives in the author's
little book entitled Weisser Through Sturies'
embeds and the writer in choose for the subpet of the rollman some single facts entereding the line of words, and she has ariseted one
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owner questioners of words the seven great
linear system of division.

THE CASE OF TREES IN LAWN, STREET AND PARK By B. E. Fernow New York Henry Hoit & Co., 1910 392 pp Price, \$2 net

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A Free Epinson is to the probable lifty of an investion will be readily give terester furnishing to with a model or of a brief description of the device in one

MUNIN & CO., 361 Breadway, New York Branch Lilies, 618 F St., beskington, D. C.

INDEX OF INVENTIONS Por which Letters Petent of the United States were lessed for the Work Ending May 10, 1910.

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"Star" == Lathes SEL PALLS MAN DO.

Engine and Foot Lathes

EHICLES OF THE AIR

T PRARNES " Upright Drills

How to Construct

An Independent Interrupte

e should be read in evanuation with tiels in BURNTIFIC ANGRICAY SUPPLE "How to Construct a 100-Mile Back Repplement custs 10 cents | M MUNN & CO., Inc., 361 Breadway, New York

OPOSET Swiss Files

and other tools shows in "The Tool Stenare"



WATER STILLS

Industrial Alcohol

Its Manufacture and Uses By JOHN K. BRACHVOGEL, M.E. 054 x 84 inches. \$28 pages.

MUREL & CO., Inc.

THE ACCIDENT TO THE "REPPRLIES."

(Concluded from page 416)

Zennella IV "did not involve the loss of any life The "Republique" catastrophe, however, was tragic On September 25th, 1909, the craft dropped from a help about 200 meters to the earth, and it passengers, Capt. Marchal, Lieut Chauve nd ite and the mechanicians, Vincennot an Reau, were killed immediately. Th

Reau, were killed immediately The disaster was occasioned by the breaking of a propeller blade which flew off the shaft and plerced the gas bag The "Sepplein II," whose untimely end has been described, was taken over by the army last year, and made a member of the German strably fleet. The vessel army fast year, and made a member of the German sirably flost. The vessel took part in fast years sirably mane-vers at Cologne where it was stationed in the spring of 1909 the vessel made a long journey from Lake Constance to Bitterfeld and return remaining unin collided with a pear tree at Goeppingen, and was partially damaged The "Zep-pelin II" had a volume of 15,000 cubic pelin II" nan a votume or to, overcume meters its length was 136 meters, and maximum diameter 13 meters. Its maximum absointe veiocity was 12½ meters a second, or 28 miles an hour its carrying capacity, including passengers. carrying capacity, including passengers and aupplies, was 8800 pounds it was provided with two cars. The two motors of the airubje developed each 115 horse-power The total weight of the V-Zoppeln's was about 23,00 pounds. The batioon frame, rigging and keef, bail toon fabric, as bags, stabilizing planes and matern, weighted 12,000 pounds The countries, see cities weighted about 2,000 pounds.

fire Centrel in the National For (Concluded from page 421) way during the fire season, whi

on way during the nre season, while the work of clearing the strips in a satisfac-tory manner, including the disposition of all refuse, is to be done by the rail-roads but under the supervision of the Forest Service

One of the most potent reasons this agreement is a good one is the fact that the courts have decided the right of the Department of Agriculture to collect damages from roads running through National Forests for fires which they cause, and this fact is a strong inducement for the roads to join with the departm in the effort to keep fires down

Another strong factor is the fact that the Northern Pacific, being a land grand road, owns considerable timber on the si ctions along its line The Great Northern, aithough it is not a jand-grant

Northern, aithough it is not a land-grant croed, also has properly at stake in lis buildings and the tine itself whose operation may be seriously interfered with hy forest confingrations. The value of beary timbs t in mountain our regions as a deterrent to avalanches, and anadatides, and fooder is also to be con addered. From the standpoint of far-sighted business policy a still throader argument is the relations of the forests to the general welfare of the regions whose traffic the reads handte. Timber which goes up in smoke pays no freight tolls and unchecked forest devastation means the enfeeblement of many industries de dent on wood and water

Sterlitation by Wrans of Eltra-Violet Mays. ems to be little doubt are

ing to The Lancet, that the germicids ction of the uitra-violet rays will shortly be made available for the purpos practical sterilization in what in what exact practical sterilization in what exact way the ultra violet rays act is not ore tain, but one view is that they prefere oxone. Whatever the nature of the at tion may be, it seems circar that their application for the purpose of sterilizing articles intended for human consumption will aliminate the objection to the use is very transparent to ultra-violet rats
milk however is practically opaque to
these rays, and special precautions have
to be taken so as to bring it thoroughty
under their influence will aliminate the objection to the use of chemical antiseptics, the effect of which upon the human organism may be harmful. In an interesting paper which has reached us on the Sterill's tion of Water by Means of Quarta it is separated from the face of the work Lamps, by Dr Max von Rocklinghausen, ing by the hiast. The current of air

lit to stated that work on a very large cale has lately been do this subject, and has developed the entire system of stertification of different tire system of sterilization of different liquids used for alimentary purposes, based on the effect of the ultra-violet rays created in Cooper liewith impa made from transparent quarts. The chief work in this line has been done by Prof Henri in the Physiological Labo-ratory of the Serbonne together with Dr. André Heibronner, who co-operated with Dr Max von Recklinghausen with a view to developing an entire stariliza view to developing an entire attriliz-ing aystem of the type described. Tho pradiminary work was done by studying the action of the ultraviolet rays on different types of microbes and the infuebra of the different wave lengths. The Roux of the institut Pasteur lu which good many of the experiments were mode presented to the Académie des Sciences some of the work done by the above cited scientists Technically speaking the results so far have been the development results so far have been the development of a small water aterilizer for hospital nae whereby 132 galloos of sterile water are produced per hour frum ordinary city water by means of one Cooper Hewitt lamp type Billien," absorbing three suppers at 110 voils. Within a short time a very large sterilizing onlift hands one somewhat abuses does not be a supposed to the supposed one process to the voil of the supposed one supposed to the supposed one sup based on somewhat similar ideas will be running which will sterilize 3500 cubic feet of water per hour, this being targe enough to treat the entire water supply of a town of about 10 000 inhabit ants. The histaliation of the lamp is stated, is a matter of no difficulty all that is necessary being to connect up to the terminals provided in the dome of the apparatus and to make the justment necessary for the voltage of the particular circuit in order that the supply of water delivered from the apparatus may be absolutely sterite or stertie to any required degree it is not essary that there should be means dealing with the various water press met with in different districts complish this purpose the init pip is filled with an adjustable valve of special pattern which can be readily sel, so that when full open the delivery from the apparatus does not exceed the quantity specified this in the case of requirements being for absolutely sicile water, being 142 gatious per hour. The water enters the chamber formed by the outer cone with a swiring motion. At the top of this cone it overflows and finds an outlet at the hottom of the inner cone up which it rises and flows out at the dis-charge pipe. The awirling motion is maintained during the complete passage of the water through the apparatus in order that II may be thoroughly stirred up and all microbes presented to the artion of the tight the water coming under tion of the tight the water coming under its influence on two distinct occusions Draining cocks are provided on the ap-parstus to enable it to be thoroughly emptied should dramstances arise whereby it would not be used for a ron-siderable time. Not only does this sys-tem provide in the case of the opporator er discussion a continuous s sterile water svallable within live min-ules, but the water or any other fiquid that may be treated is unaffected as far as taste is concerned as it retains all naturat gases and sails in sciotion work of Prof Renri Dr Relbrooser and Dr Recklinghausen has also been directed towards the complete sterlitza tion of mitk, and this they have also accomplished. The apparatus for this accomplished The apparatus for this that for the treatment of water ts very transparent to ultra-violet ravs

A New Process for the Prevention of Coal-Bust Explosions.

The production of roal dust in mines

which passes through every coal mine from one ventilating shaft to another carries the dust into every part of the galleries, which may extend for several miles The distribution of the coal dust is further increased by the convyance of coal in the mine cars, which usually move in a direction opposite to that of the nir current, so that much dust is blown from 'hom. The dust senties in the carner" and on the projections of the

the corner and on the projections of the walls of he gallery, and especially on the floor and the tups of the timbers. If the mixture of air and suspended coal thust comes into contact with a sufficiently but theme a combustible gas is suddenly generated from the coal dust this gas, known as methans, or mursh gas, known as mechane, or mursa gas is mut explosive, except when it is mixed with air, in which condition it explodes with fearful violence The shock of the explosion scatters in the air much of the coal dust which has settled on the licor and elsewhere, and the heat produced by the explosion disthe neat produced by the explosion dust a fresh quantity of methane which comes into contact with the flame in this number the explosion is propagated from point to point, often throughout the entire mine

The passible means of preventing such extensive explosions of chai dust are confined to preventing the dust from rising in the air, and to disposing of the heat produced by the initial explosion effectually that the further distillation of the coal dust and the formation of gas are prevented. The heat product by the initial explosion may be consum The heat produced in the evaporation of incombustible liquids, distributed through the work The greater the quantily of such ings The greater the quantily of such volatile liquid, and the greater the extent of surface exposed to the wave of explosion, the more rapid and effectual is the absorption of heat. The liquid used for this purpose at present water It is necessary to net or sprinkle every part of the mile in which coal dist exists. This precaution is enforced by law in Germany and Anatria but not class here even in England, America, or Franco. Most of the water applied to vertical surfaces quickly runs off, and the little that remains adjoring to the surface evaporates in a few hours. The effect persists a little longer on the floor of the gallery and other hor faces, but even the puste of coal dust water that is formed on the floor soon becomes dry Hence the application of water must be frequently repeated Too frequent watering however, is la The request watering newver, is jurious to the operation of the mine. The water seaks into the persus rock and loosees it, causing danger of cay lug. In very hot mines, the rapid evaporation of the water produces an exceedingly damp atmosphere, which very injurious to the efficiency and health

of the miners The Kruske The Krinskopf process for the prevention of roal dust explosions, which has recently been patented in Germany, employs instead of water a viscous paste, of such chemical constitution that it does not evaporate apprecially nuder the in thence of the normal air current, but themee of the normal air cirrent, not evaporates raphilly when exposed to the heat of a annill explosion. Owing to the adhesive churacter of the mane, it can be applied to all surfaces horizontal vertical and inclined and in about eight times the quantity which is possible in the case of water. The thick posts, fur thermore, does not soak into the rock and as it does not evaporate in ordinary conditions it does not increase the bushists of the atmosphere. It has been proved by experiment that a condition explosion which in its minure is progressive, one he arroscied by applying this mixture to the first hundred yards of the gallery this distance being sufficient to cause the explosion to die out owing to lack of explosive material in the actual conditions of mining the original ignition of coal dust takes place in almost every case, at the face of the



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possible to comme the explosions to the workings themselves and to protect the rest of the mine, without the nocessity of applying the same precaution through miles of galleries. This fact greatly re-duces the expense and trouble involved in the method. Practical experiments in the method. Practical experiments in a Westphalian mine and in an experimental gallery have proved the corrections of the theory upon which this process is based. In the mine, the waits process is based. In the mine, the waits application of the paste, but they dried up within six hours whom water was used. The explosion of 75 grains of dynamics produces a sufficiently power. In finance or upplied as mixture of coal dust and air when the walls of the gal dust and air when the walls of the gal-lery are dry, and for this reason the use of dynamite in coal mines is probibited by law The experiments prove that a mine gallery protected by the Krus-kopf process, more than fire ounces of dynamite can be exploded in a mixture dynamite can be oxploded in a mixture of coal gas and air without causing ignition. The experiment was repeated twelve times. After each blast, tho quantity of coal dust in the mixture was increased by the addition of a fixed amount of dry dust, but the application of the peate or water was not renewed in in these conditions, when water was

Colors of Poods.

Of the strong addiction many consum-ers have for the use of foodstuffe that are secretly and highly colored for the market, the London Lancet says "For some not quite ricar reason there "For some not quite riear reason them-are many popole who fook upon the brown egg as necessarily a now laid one, and honce a firl domand for brown eggs has arisen, which is castly met not by the honest brown egg. but by the white egg which has been steeped in a dye which readers it visually industragated able from the real article. Again, when mits happens to be of a but time, it is commonly hold to be here than white real article and the steeped in a dye than to satisfy this preference for a milk of a creamy shade White-looking butter is delilited as sooking too much milk of a creamy shade White-looking butter is disliked as tooking too much like dripping The remedy is simple, it is artificially colored Vegetables must be bright green to make them took fresh. the consumers of them being quite will-ing to ignore the fact that copper does not make them fresh or wholesome On

must be white.

"It is, of course, perfectly natural to take color as a criterion of the dietotic value or flavor of food, and the attracvalue or flavor of food, and the attrac-tive or unstructive appearance of food may make all the difference as to whether that food is, or is not, assimilated prop-erly. The deceit which is practiced by artificially coloring food may thus serve a useful purpose, so long as the coloring matter is barmiess, but as a rule the matter is parmiess, out as rule tae proceeding is an immoral one. It does not follow that because food is sustinctive its value as a food is sut while every form of sophistication is open to commercial abuse. A correspondent last week submitted to us a brown-abelied when the best to us a brown-belief to us the best to use t

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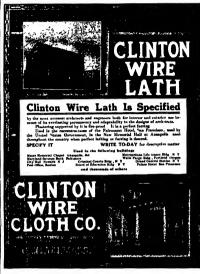


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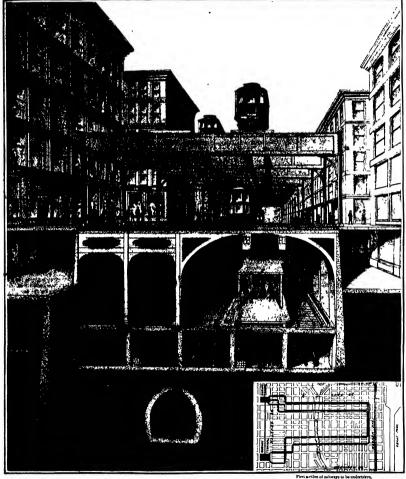






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ONG the less known, but by no means less important, sections of the broad field of settive ity covered by the Department of Agricul lure, is that which comes under the Office of Public Roads. Although this office has no administrative duties and exercises no control over the roads. of the i nited States - except of course, those that are leasted on government reservations—it is doing most important work of a scientific and educational char

The nursement for Federal assistance in the protion of good roads dates back to the year 1893, where a modest appropriation of \$10,000 was made, to enable the Secretary of Agriculture to inaugurate the work To date a sum of nearly half a million dollars has been spyropristed, and if this year's estimate be in-cluded the total reaches about six hundred thousand

A full account of the growth of this i presented on another page of this issue and it gives us much pleasure to draw particular attention to that branch of the Office of Public Roads which is known as the Division of Tests. We make this special reference on account of the high character of its organization and work, and because one of our recent edi-torials would give the impression that no such divi-sion calats. As a matter of fact this laboratory as we are informed by Director A W Page, is not only coulined with the last and most improved spparatus quipped with the last and most improved apparatus
used in European isborsieris but has developed a
number of additional lents, such as those for toughness and rementing value. Routine lests are made on
road building materials free of charge for any citizen read initiding materials free of charge for any citizen of the 'hilded States and a large amount of experi-mental and research work is being carried on in-dered it is justifishly to stale that the laboratory of the Office of Public Roads is the most completely equipped road material laboratory in the world and that the number of samples tested venry is far greater than in any similar institution. As a matter of fact, the present year about three hundred typicals of the road building rooks of England Scot isnd and Wales were lested by special request in addition to the regular routine work

ARBITRATION VERSUS SELV REDRESS.

S surely as the duct loss given telace, among A individuals to the court of justice, all the awful arbitrament of war give way to the international trilinnal, also as a corollary to this it may be written down that as its court of justice has back of it for the inforcement of its of justice has back of it for the inforcement of its descress the punitive must him to of the government so will the international court be backed by some form of international polic composed of limited maxal and military forces, in which each of the signatories to

the international court will be represented.

One of the brightest augustics of the dawn of a world wide peace is to be found in the fact that it has the fashion, during the past year or two, to speak of armies and navies as means for the preserva-tion of pence. When the leaders of the world, be they presidents kings or emperors, declare that every in pressure kings or emperors, declare that every in crease in this ormed strength of their respective coun-tries is undertaken for the express purpose of pre-serving peace the statement is generally accepted as affiners. Although the advocates of peace by arbitration deplote the enormous investment of freasure, time, and labor involved in the maintenance of the wast military organizations of the civilized world they are beginning to believe that the advocates of peace by war are as anxious as they thouselves that the world's peace be permanently preserved

The establishment of the noble principle of international arbitration will be, after all, merely a repairition in the international world of a process of evolution in the international world of a process of evolutional actional world Farago inten place in the heldridual national world Farago intended to the principle of self-redress was paramount. If wrong or finite action of the principle of self-redress was paramount. If wrong or finite world w be at band Gradually, with the grown of inser-gence, it was realised, not only that the highered party-was but a poor judge of his own cause, but that the principle of self-redress was subvarrier of the peace and happiness of the community. It was realized, also, that the man whose brain was clouded with the amole of furious passion, was not so well qualified a amoke of furious passion, was not so well qualified a judge as some third and disinterested party, who could look upon the case in dispute with an impartial eys, and so, gradually but surely, the principle of srbitra-tion took shape and became the stable rock on which our wonderful modern system of national jurispru We have before us a lucid review of the growth of

the principle of national arbitration in a pamphlet published by the Maryland Poace Society and written ler lames Brown Scott lecturer on International law ley lames Brown Roott lecturer on international law in the Gorge Washington and Johns Hopkins uni-versities. He refers to the three stages which were shown in the development of the celebrated Roman judde in sustem which were as follows: (1) The private litigant submitted his controversy to an arbiter of his own chaire for decision according to the con seleve of a cool and impurited man, 121 the maste

solute of a good and fungatilal man. 121 the magnitude of pulse chosen from an official lite or paper lite preferred to a cilibea arbitrator, (3) the administration of solid lite regarded as it had not administration of solid lite regarded as the dark and fine fore the right of the State and a leading system is persoared for said imposed upon the cilibea.

The author of the pulser acces the same minimization between states in early times they arbitration between states in early times they would choose an arbitre the topic, in modern times, some foreign nonerigin. The lark of continuity of the choice in this system, which date is the lite build date. come foreign sovereign. The lack of continuity of de-cision in this system, which desit with the ludividual cision in this system, which delit with the luddividual case, left up to the second size, dating from the first conference, which lavoised the appointment by international action of a penied of judges, from which budges formulas the temporary iribunal are chosen Westard. Says the writer, "poun the very threshold of lise tilled and final development when gations as whole de-ermine that international justice is the province of the international community and count-inte a court of international justice to which litigant states may resort in coollicts of importance. To-day much has been done. The organization, jurisdiction and procedure of like joternational tribuns! have been determined Now, we merciy awall the appointment of judges to establish a world wide court, in which the

or judges to suspine a worth the court, in which the matthean may distain judice as easily and readily as private authors in national courts of judice. The author of this paper does not go laid the ques-tion of the enforcement of the findings of international arbitration it is our belief that an international court should be backed by an army composed of drafts from the various armies of the world previous in their disarmanient limited in numbers and existing solely for the inforcement of its decrees

SIR WILLIAM BESSSEE AND RIS WORK

ITH the death of Sir William Huggins there passed away an astronomer whose plonter work in the field of astro-physics y pioneer work in the nets of matro-physics the history of acience it was largely due to Bir williams genius that the apectroscope became an lostrument of astronomical investigation bardly less important than the telescope. His work was done so loany years ago, and its results have been so farreaching, that it is easy enough to value it at its true

Huggine began his studies shortly after Kirchoff Huggine began his studies shortly siter Kirchoff applied the terrestrials science of spectrum snalysis to the study of the sun Parity as a result of lingsine's efforts astronomers have been enable to observe the solar prominences at any time, without erry the solar prominences at any time, without willing for an eclipse, for the principle of spectra-copic viability of prominence lines at the edge of an uncerlipsed sun was quite explicitly stated by him in February 1888. He even devised various instruments or hringing the prominences into actual view. His use of the 'open silt' on February 1889, may be add to have begun the modern study of sofar prominences. Meters the days of the 'open silt' or prominences had been azamined only 'no sections' or more actually the study of the 'open silt' or prominence had been azamined only 'no sections'.

nences had been axumined only in sections. The first templite results is the estimation of movements of approach and recommon between the earth and the stars, by means of Doppher's principle, were communicated by Sir William Huggins to the Royal Society on April Start, 1886. Application of this method is the stars is eccompassed with difficulties; for it needs a powerful disperses to show a minute line of displacement, and powerful disperses to show the star is secondaries.

eion involves a strictly propertionate enterphisms of light. Helpoing the brightest star in the histories as the most promising subject of experiment, Mugal considered the F line in the spectrum of String to considered the F line in the spectrum of String to just so much displaced toward the red as to insit recession at the rate of 38 miles a second. The inqui was reasuned by Huggins with improved apparatus the following year, when the velocities of thirty at well and the second of the second of the second William Huggins's schlerement was not, however William Haughts's coliverensis was not, because of center the mytom in the proof offert the mytom in the proof of the center that the method of preserving state. He method has been of incellatable value, so much as, that spect monopies resistant the method of preserving state. He method has been of incellatable value, a leading part affirm that the proof of the preserving of the rest and complex resistance she when he will be supported to play a leading part affirm and the preserven now we distributed the state of the preserven now we distributed the state of the preserven now we distributed that the state of the preserven now we distributed that the state of the preserven now we distributed that the state of the preserven now the state of the preserven now we distribute the state of the preserven now the state of the state o

Many and parts

ceived to be self-luminous and to be formed, to as extent, of glowing gas. The next step was to mine he nature of this gas, a problem first att by Sir William Huggins in 1868. Winnecke's o

In the field of stallar spectroscopy ruggests is assuredly monumental Almost simultaneously discovering the stallar spectroscopy was entered sizes. The stallar spectral in Roms, and by Lewis M Rutherfurd in New York gins ma) well be considered as one of the fathers of gins may well be considered as one of the fathers of stellar spectroscopy. When he brought to a successful submination his early experiments in spectroscopic photography, we restly began to learn something of the composition of the fixed stars. On December 188s,

the composition or one naces stars. On Increment parts in 1379, he was able to communicate to the Royal Society results surwering to his expectations. The dry-plaine process, with which such wonderful results have been obtained in astronomical photography, appears to have been first made available by sile willism. Muggline in photographing the spectrum of Vega in 1866 That work jaid the foundation for the brilliant application of photography is astronomy by Common, Draper, Janusen Rutherfurd, and later as-

A lairly complete preliminary answer to the ques-tion, 'What are the stars made of'" was given by SIT William Huggins in 1864 By laboriously com-paring stellar dark lines and the bright rays emitted by terrestrial aubstances he sought to verify his con-clusions regardless of cost in time and trouble. Al-though he himself sverred that the full investigation of a single star spectrum would be the work of years, be was able to furnish however detailed and accurate

drawings of the spectra of Betelgeux and Aldebaran Before Huggins applied the spectroscope to the sindy of nebulae, it was felt that these mysterious, filmy objects of light would forever thwart the astron Such new and more powerful tolerscope that made its appearance had resolved into clusters stars which previously had appeared to the naked eye as single order it was felt that those filmy stars which had resisted all attempts at telescopic resolution might be similar clusters, for which reason some dou spining fluid

ugust 29th, 1864, Bir William Huggir through his prisms the rays of a bright planetary nebulæ in Draco. To his infinite surprise, they proved neous in Livaco. To all indinis surprise, tary provise to be of one reior mainly and thereby preclaimed their gaseons nature Thus Herschel's conjecture of a "shining full' diffused at large throughout the common was unexpectedly verified. By 1868 Huggias had sep-urately examined the spectra of about seventy mebals, of which one-third displayed gaseous characteristics. of which one-third displayed gaseous characteristics. All of these gave the green ray fradamental bits be solved in the spectrum and emanating from an unknown form of matter ansmad by Ragista, "solvium." A successful beginning in solviar spectragraphy was made by fits "William Huggins one' March 17th, 1888. Five lines in all stamped themselves upon a plate, expended to the rays of the sebula in Orlino. However, was photgraphy definitely made the series of the relationship.

nabulas

The effect of Huggins's work has been to remore the
astronomy from the ere-piece of the telescope, to unbstitute for the retina the more sensitive photographic
plate, and to teach the astronomer the immessivable

astronomer the composition plate, and to beside the servicemen instrumentarial value of the spectracrops in analyzing the composition of stars which in the intercope appear is more highly related in a make canopy. Hungshap introduce physical methods too astronomy and theselvate the observatory has a knowthry.

THE ACHIALTYCS.

THE ACHIALTYCS.

THE BASE discharge for these Montriples to Charge rouns, a finishes of these, is nation across countries disks, was made in a biplane at a claimed and sign achies na hour.

Course Mass. h Helgish, Sew 2 hours and 51 min-with a passauger in France on the 18th instant. This sight was also made in a hiplane and constitutes

Jan. (Higher & Elsymon has been making some ex-sultient Hights of nearly a half hours duration at factori, L. F., in the Parman thylmon which he per-riqued form Pasithan. On the lits he gain the pilot-sighter (issues et the Auro Clab of America or making comparing the light. He is in the first sunstear sportman in Elegents to him up awaition, and is doing a great deal

is stores, of Washington, D. Q. who has been Mr is like in the control of the like in the control of the like in the control of the control o

on MENy 18th, the day when the tall of Halley's comat-wise supported to sweep over the earth, Frot, A. Law-riance Rotch sent up a series of zounding ballooms down in Hills Hill! Observatory These ballooms were equipped with meteorographs and with appearation for elasting samples of the six thigh stitteds. Frot. Batchi's observations were made simultaneously with Samples Engoles, Some members of the No. On May 18th, the day when the tall of Halley's co Stronghout Europe. Some mambers of the U S Seciogical Survay also attempted to catch particles of sometary dust at the Carnegie Observatory on Mount California, hy placing on a high tower a plate with giverine Several balloon parties were coated with giverine Several balloon parties were when it was pearest to us.

Another new monopiane that has flown successfully to that of Mr. Gardner Hubbard, which was built by Mesers. McCorff and Baldwell, that Baddeel, Canada This machine is a cross between the Bierlot and Antiente types. It has 800 square feet of support surrance, the overall length being 34 feet and the aprent of the wings 50 feet 2 inches It weights compete about 1,000 pounds without the aviator, a 40-borney power, size-springer weter-cooled motor of 250 pounds weight furnishing the motive power The propeller in driven by surveyeas and chain, with a gear reduction driven by surveyeas and chain, with a gear reduction ven by sprockets and chain, with a gear reduction driven by aprochets and chain, with a gear reduction of three to five, On April 8th, nise flights were made above the ice on Lake Bras d'Or, hy Mr. Hubbard, who had nevar Sown before. The monoplans reached an elevation of about ten feet, and flew sevaral hundred

In a recent aeronautic note we mentioned an aero plane flight of five minutes duration with four pessengers. As a matter of fact M Roger Sommer took but three passengers with him ou his record breaking fight of April 20th. These were Mile Dutrieux (46 s, 96 pounds) and MM Colombo 160 kilo grammes, 132 pounds) and Frey (58 kilogrammes, 128 pounds) Sommer himself weighs 151 pounds. The total live load was \$10 pounds, and the weight of the hiplane tive load war 110 pounds, and the weight of the hiphane complete was 560 pounds, making a total weight of 1,000 pounds that the 10-horse-power domes motive raised in the air in 50 seconds. The weight-lifting shielency of Sommer's mechine is therefore 50 pounds. The preprious record of this kind was made by Haury Narman with a similar machine when he cor-ceed 10 kilmenters in 10% institute with two posen-gars weighting 110 hilogrammes plus 10 kilogrammes

of ballant.

On the 9th instant Heasen, A. H. Ferbes and J. C. Transi made an accommon at Quincy III, In the former's present of the property
ELECTRICITY.

By ming a sections of the sensitive telephone relay, the heart bests of a patient in London were transmitted to the home of John Milne, the noted seismologist, on the Laie of Wight. The heart throbs were heard by four physicians over an ordin throbs were heard by four physicians over an ordin-ary telephone, and so clear, was the transmission that it was possible to diagnose the heart troubles. It is expected that this use of the stethoscope with a telephone relay will enable physicians to keep in bet-ter touch with their patients.

An electrical thermometer which is very sensitive to alight fluctuations of temperature, has recently been put out by a German company for medical use, to determine the degrees of favor It consists of a coll of platinum wire inclosed in a quarts glass tube. through which a current is passed from a four-voit storage battery. The tube is placed in the armpit of the patient, and a milli volumeter indicates variaof the patient, and a milit voltmeter indicates varia-tions it the resistance of the coil, due to the heat of the body. The milit-voltmeter traces a tempera-ture curve on a band of paper, and in this way it is possible to atudy the action of drugs on the patient.

According to a recent press report, steamships of the French trans-Atlantic line are using the apparto a French trans-attainte line are using the appar-atus invanted by Signors Seitini and Tosi of the Italian navy, by which wireless messages may be transmitted in and received from, any desired direc-tion. The particular advantage of this apparatus on shipboard is the fact that it enables the operator to determine from what direction a signal is coming. determine from wat direction a signal is coming, and the course of the vessel can be governed accordingly. Recently the "Provence" crossed the Atlantic, equipped with this apparatus, and was ab'e to determine the positions of various vessels passing in the vicinity. The danger of collision was thus entirely

An interesting paper on insulating materials for wireless talegraphy was read recently before a meet-ing of the Wireless institute in this city by Mr Stan ley M. Hills. He pointed out that rubber is not perley M. Hills. He pointed out that rubber is not per-manent, but spit to destrortes, that marble is hydro-scopio and not to be relied upon because or its irregu-lar composition, that porelain is age to contain hid den defects, and that giass, while the defects it con-tains may be destread visually and thus avoided, is extremely fragile Hs spoks of mice and of wood as good issuitators if kept dry, and dry oil is and of the spit of the period of the period of the period timulator for the reason that it is itquid and "self-henling" Dry air makes an excellent insulator, and for high voltages, compressed air may be used

The advantages of an electrical shovel over a steam shovel have recently been portrayed, showing that wherever electricity is available at moderate rates. the electric shovel is much to be preferred. One of the great objections to the steam shoval is the fact that the expenses of a fireman must be paid, and the fuel, as wall as the water, have frequently to be carted for a very long distance. Steam must be kept up continuously, despita all delays in operating the shovel, while for the electric shovel the name arguments apply as are made in behalf of electric drive in machine shops, namely, that when the shovel is idle there is no consumption of power, yet the power is ready for instant use whenever it is needed

is restly for Instant use whenever it is monded. An interesting discussion by Dr. Charine P Steinmets on the magnetic properties of materials were published in a recent number of the Electrical World It was stated some years ago that magnetic alloys could be made by combining non-magnetic matings. Dr. Steinmets points to the fact that is all the freuer large managenees is used, and that this is ellightly ferro-magnetic One of the simplest of these alloys recolasts is combining one part of managenee with three parts of autimony, the mixture being made by powdering the mains and then beating them in a test take. The result is a black goveler which its around; alloy has been found which does not contain some of the ferro-magnetic group—lron, cobalt, nicksi, managenee, and chrontism. the ferro-magnetic grou

Now that air craft have been entersels, invantors are beginning to cast about for some effective means of destroying them. Recently an serial tornedo has been invented, which, by means of a Hertzian wave controlling system, may be on a nerusina wave controlling system, may be directed from a distance without carrying any oper-ator. This dorpedo was exhibited at the London Hippodrome, where the townter caused it to traval out over the andience, sterling it wherever he chose by pressing buttons on a switchboard on the stage by pressing buttons on a switchboard on the sing The topped is provided with two servers, which may be operated independently to steer the ship interact, while a horizontal rudder serve to steer the reser-veriestly. The device may also be equipped with accidentive, to be dropped on the senser when the horizon has been masservered to the right position. This, was demonstrated at the Hippodrome by relea-ling Strippe, eq. the admission.

SCIENCE

Bewerd B. Gerriott, chief forecaster of the United States Weather Bureau, died recently at Washington at the age of 8? He had been connected with the Weather Bureau practically since its cetablishment, which means for forty years

After thirty months' cruising in Philippine waters, the Fish and Game Commissions steamer Alba rices," Commander C M McCormick, United States Navy, entered the Golden Gate, San Francisco and dropped anchor The "Albatross" has been engaged in a thorough examination of the San in Philippine

When one solid body gildes over the surface of an wass one solid body gittee over the surface of an other, the coefficient of friction diminishes as the ve-locity increases and nearly vanishes when the ve-locity attains a certain critical value. This diminu tion of friction is due to the air which partially sepa rates the two bodies at low relative velocities and rates them completely at the critical and all bigher velocities.

Dr Douglas Mawson, who accompanied Sir Ernest Shacklaton on his last Antarctic expedition, arrived recently in this country, bound for Sydney New South Wales, to resume his duties as lecturer on geology in wates, to resume his duties as incturer on geology in Sydney University Dr Mawson reiterated the state-ments aiready made by Sir Ernest Shackleion that there is an immense stream of coal within 300 miles from the South Pole

from the south rote.

An interesting method for measuring the transparency of developed photographic plates has been developed by the property of the property their optical axes, will reduce the angle of 90 deg extreme brightness and maximu by an amount proportional to the density of the sit-

The emission spectra produced by certain elements cated in quartz tubes to 2500 deg F have recently been studied it is found that in these circumstances aulphur produces a blue light and a nearly continu ous spectrum Selenium gives a pale yellow light with bands, which are generally well defined, but be come uncertain toward the red end Tellurium emits a green light and its spectrum contains numerous bands which are also hazy toward the red end Phosphorus and sreenic give a white light and continuous spectra, while autimony produces a nearly continuous spectrum, crossed by very ill-defined bands

The distinguished German chemist Ostwald has taken out a German patent for the improvement of drawing inks and water colors. He has found that by the addition of small quantities (from 1 100 to 1 1,000) of volatite organic compounds of the aliphatic series, which are soluble in water, at least to a small extent and contain not less than four atoms of carinks, drawing inks and other water colors s rendered capable of readily marking such surfaces as rendered capable of readily marking such surfaces as parchment livory, waxed paper etc in the case of neutral liquids, an sicohol, ester, or other neutral sub stance is used, white to sold inks, free fatty solds, such as valeric or caproit at d may be added

How bright is the sun? No two authorities agree Another estimate has recently been made by t' Nord mann. The effective temperature determined with his pyrometer was found to be about 5 320 deg she Now, the brightness of an incandescent body emitting te light varies sensibly as a function perature, and this law has been verified by compari son with numerous terrestrial light sources. Taking into consideration the absorption of the solar atmosphere, the effective temperature of the photosphere is probably about 6,450 deg absolute. The correspond is proceasily about 6,400 deg assolute. The corresponding brightness of the mean effective layer is then about 319 000 decimal candles per square centimeter. This noiar surface is thus considered to behave very like a hisck body, and to have an emissive power of nearly unity

Ducellies has made a study of the chemical char-Procelles has made a study of the chemical char-acter of various alloys of cobait with tin, antimony hismuth, lead, and copper, by measuring the dif-ference of potential between each alloy and each of its constituents, when immersed in a solution of to constitute, were immersed in a solution or cobait sulphate. The results are expressed in graphical form. The curve of the cobait-tin alloys shows a distinct inflection at the percentage of 68.76 of its, which corresponds to the compound CoSn. The cobaitantimony curve indicates the existence of two definite compounds, CoSb and CoSb,. The cobatt blamuth at loys also show two distinct compounds. The electromotive force produced by most of these alloys is a very small. The curves show that in the separation of the two metals by the process of solution, the cobalt remains undissolved in practically pure condition, while the solution of hismuth contains about 5 per cent of coheit. The behavior of the coheit lead alloys as similar to that of the alloys of coheit and hismuth.

Hrobdingnag
ian propor
tions the
freight engine

leas grawn The two men inside the 41 inch low pres-sore cylinders one of them seated, the

seated, the staiwart me itemic standing erect in the 90 luch front end of the boller with a foot and a half charance be

tween his head and the roof, tell their own

story of di-mensions To this may be added the fol-

THE LATEST GIANT FREIGHT ENGINE

FOR USE, ON THE HEAVY GRADES OF THE DELAWARE & HUDSON RAILROAD cylinders 26 inches diameter by 28 inches streke Each engine drives eight, coupled, 51-inch driving wheels which carry the whole weight, 445,000 pounds,

It takes but a glance at these photographs of the hugo belaware & itudison freight engine recently turned out from the shops of the American Locomotive realiza to what



A man can be comfortably seated in each of the 41-inch lew-pres are cylinders.

added the fol-lowing particulars. There are, as usual in the articu-lated type, two engines on two trucks, the forward a low pressure with cylinders 41 inches diameter by 28 inches stroke, the after engine a high pressure with

ring, has a total heating surface of 6,639 square fact; and it supplies steam at 250 younds pressure. The tender carries 9,000 gallons of water and 14

tons of book

its weight loaded is 164, 300 pounds, and the augine and tender #

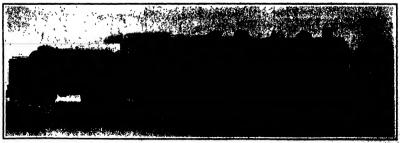
rpe Server

has built six d

these engines ware & Hudson at end of holier in Tig feet diameters. ware & Hudson O o m p an f. They are designed for pusher service on the Wilkeslarro & Susquehauna division of that road, between Carbondele, Pa, and Oneonte, N Y—a distance of \$5

of the engine. The tractive power working compound is 105,000 pounds, and the calculated horse-power un-der ordinary working is over 2,500. The huge boiler, 30 laches diameter at its smallest (Concluded on page 440)

The hurs belier is the secret of an American lecomotive's great newer.



200 17 . THE LATEST OF THE MUSE ARTICULATED PRESENT RESISTS.

Liffel's Recent Experiments on the Resistance of the Air

BY JACQUES BOYER

Elliulus first experiments on the resistance of the air, a problem which is now engaging the attention of many accentized because of its importance in sericantics, were made in 18074 at the famous Biffel Tower, which was constructed for the Paris Browletian of 1895. The surriess on which the pressure of patients of the second story of the tower, in connection with a chrosoprephic apparatus, which recorded the resistance opposed by the air, which recorded the resistance opposed by the air story of the content of

16. 101d.

The velocity of this ranged from so to 180 feet per account. The appa-ratus was guided in its fail by a vertical cable, and was prevented from striking the ground by a pro-gressive enlargement of this cable grossive enlargement of this cable beginning at the height of about 70 feet from the ground. In this way the falling body was gradually brought to rest by the action of spring brakes. A tuning fork, making 100 vibrations per second, was attached to the surface. To was attached to the surrace. To one of the prongs of this tuning fork was attached a style, which as the fork vibrated, moved verti-cally over the surface of a vertical cylinder, which was covared with paper roated with lamphlack, and was caused to revolve with a sp was caused to revolve with a speed proportional to the velocity of fall Hence the record takes the form of a fine sinusoid, the median line or

a fine sinusoid, the median line or axis of which forms an irregular line around the cylin-der Each point of this axis corresponds to a certain position of the falling body. The number of undus-tions between this point and the beginning of the trace, gives the time; the ordinate of the point inditimes, gives the time the ordinate of the point insti-cited the institute of the springs, and consequently the pressure of the fir on the surface, at that instant; and the abcins is preportional to the distance through which the body has fallen. Hence the trace gives the position and velocity of the body and the resistance position and velocity of the body and the resistance position and velocity of the body and the resistance in the position of the second of the second of the second Eiffel apprimented in this way in the proposed planes surfaces, and even with appearing directair, continues, and cut or perforated, with groups of superposed planes surfaces, and even with appearing and conficient pro-fer surfaces and were with appeared and conficient presidence the surface of the surface of the surface of the velocity. The approach of the relative square of the velocity. The approach of the relative square of the velocity. The exponent of the valocity differs very slightly from 2 and appears to increase regularly with the velocity, passing through the value 2, at the velocity of 110 feet per second. The pressure per square inch was furthermore found to increase with the area of the surface

each other is very great. In some cases the resistance is smaller for a group of surfaces than for a single surface. For surfaces inclined to the direction of the wind, Effel formulated in 1908 the following law For wind, Siffel formulated in 1805 the ronowing law row inclinations to the horizon varying between 0 and 30 degrees, the pressure is proportional to the angle, while for inclinations greater than 30 degrees, the re-

In order to extend these observations (which have

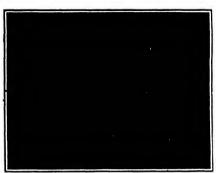


Fig. 8.—The Eiffel acrodynamic balance placed above the experiment room

been fully described in the SCHRIFF AMERICAN) Elifel constructed in 1909 an aarodynamic laboratory at the Champ de Mars, Paris, where he has aubsequently codducted experiments with fixed surfaces, exp

Consideration with the second and consequently of a consequently of the consequent of the components as well as the consequent of the consequent of the components as well as the consequent of the consequent of the components as well as the consequent of the co components, as well as the center of pressure, data which are very important in the construction of aero which are very important in the countriction to acco-planes. The serodynamic balance is shown in dia gram in Figs. 1 and 1. The experimental surface in attached to the rod C, which is placed parallel to the nt. This rod is attached to a rigid T-shi a DH, which is cape bia of motion ar The action of the air current is opp

an upward pull at f produced by the weight P, in the balance above. When equilibrium is established the moment of the forces which tend to move the experimental aurface and its support round move the experimental aurisce and its support round the knife edge A, can be computed from the weight in the scale pan. Two weighings are made, when the air is at rest and when it is in motion at known veloc-ity. The moment produced by the air current is the difference of the two roults. The other end of the

two results. The other end of the rod E carries a second knife edge B, which is directed upward and which can be brought to bear ugainst its seat by shortening the against to seat by shorrening the od H, by means of the eccentric G. In this way the moment of the air pressure around B can be measured. Thus it is possible to measured. ure the moments of the pres with respect to two points, further more, as the rod C can be rotated about its axis, the elements of the surface can be determined by mak ing four measurements, at asi mutha differing by a right angle. The vertical part D is a rod of cast steel, which is capable of slight motion in a sheath attached to the floor of the room above, on which the balance stands. This sheath which is very narrow and is be a the vertical rod from the air our rent, without approximally affecting the latter . The horizontal part & the latter 'The normontal part b' is provided with a pair of knife edges at each and The knife edges at the frunt or windward end a are directed downward and back ward, white those of the other end. are directed upward and b

ward The seats of these kulfe edges have projections, which provent the kulfe edges from moving along the grooves in which they turn. By moving a lover, the knife edges in front can be lifted from their seats to protect them from wear, except during the actual exprotect them from wear, exveyli during the actual ex-periment Time 70d II, which connects the frame B with the beam of the balance, touches those paris only by means of kinlle edges. In abort all the moving parts of the apparatus turn on kinlle edges, and the friction in nevilicitis. The Te-shaped piece IB weights more than 100 pounds. This great weight is not an inconsenience but serves two useful jurposes. by less enling and damping the secondary socilitations, due to small variations in the force of the air currents and by making the equilibrium of the balar every relative position of the current and the surface The entire apparatus is supported by a massive wood platform, about 8 feet square, which rests on a double layer of sleepers, burled 10 feet below the floor of the room and tving parallel with the direction of the air

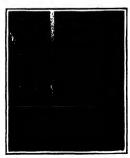
The current of air is drawn through a tube 64 fe in diameter, and every presaution is taken to keep its strength uniform during the experiment. The air is drawn from a large closed room in which the surfa-



Try: 4. Reputtment room of Millers accorde



Pir. 7.-The inlet of the blower.



8 —Arrangement of apparatus for measuring pressures at various points of the sarince.

nt are deduced from The velocities of the air curre The velocities of the air current are deduced from the readings of manometers, and the results have been writted in the following manner. One of the aur facts exposed to the current was perforated with a sarge number of holes, in

one h of which was countersonk a screw, having at tersunk a screw, naving at its center an orifice 1/50 inch in dismoter By measuring with a small manonieter the pressure produced behind each of these orifices, and inte-grating the result, the same resultant force that had been indicated by the balance was obtained

438

We cannot here relate in detail all the interest ing results which Riffel and his assistant Léon HIIH have aiready ob-We will mention only a few of the more important

Elffel has proved that the value of the horizon tal component, or resist ance to the advance of an seropisne, increases continusly with the incline tion of the surface to the horizon, while the vertical nt attains a max rompor an inclination of 15 degrees, and thereafter diminishes very rapidly, and vanishes at 90 degrees. mum at an inclination of i c, when the plane is ver

The surfaces employed in these experiments had a pisne of symmetry paralici to the wind in order tions of the air flaments in this plane, a short and very light wire, attached to the end of a thin rod, was placed at various points of the plane, and the position and direction of the wire were deter mined as accurately as possible in most cases it was found that especially near the front edge of the surface, the direction of

the wire fluctuated rapidly between two fixed limits This fluctuation in the between two fixed limits This fluctuation in the direction of the wire is due to the fact that at any instant the air flows according to a definite, but not very stable, system so that only a very small influence is required to pass from one ayaim to another The various possible systems of flow could be approximately determined by careful observation and com-

parison of the directions of the wire
Fig 3 shows the directions of the air flaments non a square surface, the plane of which makes an angle of 40 degrees with the direction of the current Pig. 4 shows the directions of the stream lines near a surs shows the directions of the stream lines mar a sur-face inclined 30 degrees to the current. It will be ob-served that these lines are very variable and conse-sed that these lines are very variable and conse-tations the stream of the surface and the surface is perpendicular to the current. Pig 5 shows the average direction of the sir at various polits in this case in the two regions inclosed by the fetted lines, the disturbance is no great that no mean direction of second by defermined lottless that the surface of the surface of the surface in the surface of the su

with the center of figures if the surface is he

to 15 degrees, and thesce roosies as the instancions is increased, and again attains the center of figure when the surface becomes perpendicular to the extremt. Finally, Effel inforces the almost universally preference of aviators for curved sustaining surfaces, preference of aviators for curved sustaining surread and proves that, for a given resistance to forew movement, the curved surface always develops greater lifting power than the plans surface, as cially at small inclinations.

The Transit of Maller's Count.

The Transite of Malley's Comes. The transit of Halley's Comes. The transit of Halley's come and the aspected immersion of the earth in the tail of that historic body have provan once more what may happen to the best-ind plans of mathematicians. The transit undoubtedly the transit of the tra

E

FIG 9

FIG 8

FIG.4

PIG 6

beaves that the property of the second proper pealings which might suchly be attributed to the infin-ence of the comet. All this labor is now in vain, Simil-larly, it is very unlikely that the instructions such forth by the United States Hydrigraphic Office far wireless operators, charging them to note any diricus and unusual effects on their instruments, will prove and unusual effects on their instruments, will prove

barren.

The expedition which was sent to the Hawsitai,
Islands by the Astronomical and Astrophysikal Society
of America for the purpose of observing the transit
cables a preliminary report of complete inhaltifif is
note any transit whatever. This was more or less sepected in 1863 a transit occurred which was fortunately

observed by Mr Piniag at the Capo of Good Hope: The comet of 1882 was The comet of 1882 was followed by him "continuously right into the belling of the limb," No scenar had it touched it, than it vanished as if de-stroyed So sudden was the disappearance, that the comet was at first beileved to have passed be-lieved to have passed be-hind the sun. As a mat-ler of fart, the observers at the Cape had witnessed. a genuine transit The experience of the observers at the Hawsilan Isl rnds with Halley's comet seems to have been exectty similar On the whois this apparent failure to observe the creeping of a hinck speck across the face of the sun may be deemed at onfirmation of our present theories that the present theories that the bulk of a cemet is much too filmsy to be detected in the blinding giare of our central juminary

Although the passage of of Halley's comet turned cut to be an extraordin ary disappointment, it is unfair to charge our mathematical astronomers with incompetence A count's tail is so capri-cious, so fluctuating a structure, it changes with such startling rapidity, that the predictions of any astronomer with regard to its behavior must al-ways be stated with some

The tail of Hallay's comet has conducted itself in a most whimsical fashion In the middle of February, it was some fit teen million miles long. In April, it seemed to

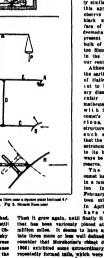


Fig 1 The Riffel secolynau to the air current c beinnes. Fig 2. Diagram of the setance. Fig. 2. Direction of atream line:
Fig 4 Stream lines near a equare plate inclined 2 " to the sir current.

a equare plate perpendicular to the air current.

ciaimed indubitably that the earth was still untouched, and that contrary to expoctations, the comer was still in the east Prof W W Campbell, of the Lide Chervatory, saw the contex visibly in the eastern sky Accreding to him, the tail was at least 10d degree long and larged far behind the radius vector Bonnas of the angle of 15-0d degrees which separates the surfax orbit from that of the count, the currently of the ball, to which this attracedlary misserfeitzes may probably be traced, probably prevented the earth from coming in contact with it.

from coming in contact with it. All the section around a contact with it all the section around a contact with pershally contact to various parts of the earth will pershally contact the section and the section is parts of the section and the section is parts in must have proceeded to their destinations at the University of Christiants, went to Kacijest, in the University of Christiants, went to Kacijest, in the University of Christiants, went to Kacijest, of the University of Christiants, went to Kacijest, and printendarij to chemical white the country fatt, and printendarij to chemical with the chemica

In April, its nessued to
In April, its nessued to
Then it grow again, until finally it attained a length
that has been variously placed at twinny to frotty
million miles. It deems to have spoil, immerged
to the consider has been to have spoil, immerged
to the consider that foreshooiny chapter of 1985 (comes C.
1980) satisfied more extraordinary change; that it
properately formed stale, which were distanted to drift
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Correspondence.

Mally pd. Myro.

PRANCETO ARROPLANT EXPORTS.

or of the SCHRYIPIO AMERICAN

iniving to your communication of recent date, regasting me to forward a drawing of an apparate which some French fournal has stated I have for a ing the height of an acroplane in flight, I beg leave to say that there is some inaccuracy in the

Seen to say that there is some measurements as quoted.
Prinarily, the asparaitie used were merely a roughly-leader "range Feke," such as has been in use for since time in the Coust Artillary Corps for computing the "burns and shorts" that occur during their big-gin procedus. Becondarily, in a for as accuracy is apported. He cannot by any imagining be considered, it cannot be any mention employing two

époerrade, it cannot by any imagining be considered per accurate au a trianguistion method employing two imanism with a long connecting base lina. "The "reaspe rake" is simply a wand shout three jeet an langth, having at one and a set of fine new-iotal pissed at right angies to the wand on a metal stelp several inches in longth Monarements are taken between each to the right and lett of the mid-

The principle on which this depends is that of simi The principle on when this depends is that or simi-lar triangles, the same being filturitated by the accom-panying diagram. From this diagram and description is can readily be seen that the short base line pre-cludes any great accuracy in the computations. However, to apply the facts to the particular flight



MRASURING ALTITUDE OF ARROPLANCE WITH A BANGE BAKE. BO : A D : ; of ; A x ; of width of antopia managed on the rake

which was referred to in the French journal, I am of opinion, personally, that Paulban actually attained

an elevation of approximately forty-six hundred feet, for the following reasons.

1 The official figures were taken by two transits

set one thousand feet apart. The solution of the ob-tained triangles gave him an altitude of 4,165 feet. The method and computations of the triangles were undoubtedly correct. The error, if any, was due to the fact that he attained his maximum height when crossing the line joining the transits. This so appeared to me At that time, owing to the acuteness of the angle of elevation, it was impossible for either transit to take a reading, both being interfered with by the horizontal bases of the instruments. The maximum height as taken by those transits was when Paul han was distant from the base line approximately one mile.

2 Panihan had with him an anerold barometer, corrected but not sealed. Ha stated that this regis-tered a maximum of 4,500 feet (after being reduced

From meters).

3 The maximum height as taken by Capt Samuel Bottoms, Coast Artillery Corps, U S A., and myself with a "range rake" was 5,387 feet., "From all of the above 1 am of the opinion given above, vis., 'that Louis Paulsan actually attained a

abore, vite, 'that Louis Paulhan actually attained a highly of apprecipinately from thomans six hundred feet at the Los Augustes meet, but am also of opinion sheat the official figures of (1,50 feet owns the only which could have been accepted under the circum-stances, Lorentzeinat Signat Corpe, Diptol States Army, 'Projection of San Frencisco, Oct.

Scientific American

NOW ORIGING IS SOLVING ITS MAPID TRANSPIT PROBLEM. AT D. R. STREET

The city of Chicago has been hard at work rehabili-The city of Chicago has been hard at work rebabilities its unrives extractor avaisant, and compilating plans for the new subway littles. The engineers of the city have estimated how many passengers enter and leave Chicago's six square miles of business are very treasty-four hours, and the results prove that the present lines are hopolessly overworked During or committee of the past year? It was found or committee days of the past year? It was found to the past year? two normal business days of the past year it was found that on all of the lines running into the down town districts bounded by Chicago Avanne on the north, by Twelith Street on the south, on the west by Haisted Street, and on the east by Lake Michigan, an area of about at sequence mites, every zeventh passenger was without a seat. When it is remembered that he service cannot be improved much along present lines, it is clearly seen that a subway is importative at a conservative sections, the maxif generation will describe the service cannot be improved much along present intend. At a conservative sections, the maxif generation will trict of the efty equal to all facilities now available from the central part of New York city, with all its from the central part of New York city, with all its ferries, tunnels, subways, bridge and enriace lines. To meet this need, the engineers have planned a sysch it is believed will adequately meet this

great demand for cars during the rush hours
The completesystem will be bounded on the north hy
Chicago Avenus, on the south hy Twenty-second Street, Chicago Avenua, on the south by Twenty-second Street, on the west by Haisted Street, and on the east by Wabsah Avenue Four terminal stations will be built immediately at the boundaries of this subway zone, one at Chicago Avenus and North Franklin Street, one at Dearborn and Twenty-second Streets, another at Dearborn and Twenty-second Sireets, another at Van Buren and Hairde Sireets, and the fourth at Randolph and Hairde Sireets. The new underground will begin where the four cloward lines now enter the district, and all surface cans from the respective quarters of the edity will also converge at these four terminal stations, where all surface and slevated cars from the resident districts will become subway cars, and will remain under the surface outlit they again pass ont of the district.

ont of the district.

As shown in the front page plan, a four-track route
will run close to the surface of Wahash Avenne from
Chicago Avenue to Twenty-second Street This route
will carry all through cars from the South and North will carry all though cars from the south and North fildes, two tracks being exclusively for surface cars and two for elevated trains. After passing to the opposits limit of the district, the trains from each direction will turn about and will return to their

respective starting points by the sams route
From the West Side of the city two tubes will run
in beneath Randolph and Washington Streets as abown in the accompanying plan, and will turn south-ward on State Street, and then return to the West Side under Adams Street and Jackson Bonlevard After coming out into daylight at the Halated Street terminal, these cars will also scatter to all points on the west side of the river

To complete this first stage of pian one will cost about forty millions of dollars. Its capacity will be fifty per cent greater than that of all the traction lines now operating within the district With the aid of surface cars to make abort hanls within the district, this plan will serve the needs of

business district, this plan will serve the needs of the city for many years.

An additional expenditure of forty millions will then build the second stage of this plan, when other the stage of the second stage of the plan, when other this stage of the development will be found both loops and through routes for all parts of Chicago. Yet where the various trunsels cross one another there will be no grade crossings one tube will dip in its course so as to pass completely under the other line than will allimate all daagen of underground colli-rias will allimate all daagen of underground colli-

A further expenditure of thirty-two million doll A further expenditure of thirty-two million dollars, will serve to complict the system, when every street within the enlway zone will have because it is branch to the system of the system of the system of the system of the entire district will be seyed by the most ellowate, yet the most efficient will be seyed by the most ellowate, yet the most efficient, suffery system in the world. This plan, in its completed form, will cost about one handed and vertex millions of deliars, and will serve the needs of the city at its present rate of growth will like improve the state of the city at the property of the city at the present rate of growth will like improve best desired and temperature.

mill 1850 Improved nesthods of transportation will probably cause the business district to expand, and the subvey will be built secretary it may nitratify be possible to remove verry yeard or rail and every ear from the surface of dever-form streets. On our frust page is shown a cross-section of one of the future existence on Wabash Aventso. As seen in this picture, the tracks its close to the street surface became or the danger to certain building foundations, is lew-level subvey is impracticable, and the contest of the probletter as the sutre subvey is to the contest, the picture of the probletter as the sutre subvey is to the contest, the probletter is the contest of the probletter as the sutre subvey is to these cases of the subvey will must be so possible to the contest of the contest of the subvey will must be so possible to the contest of the subvey will must be so possible to the first of the contest of the subvey will must be so possible to the later heavy presence from any side.

and the engineers have worked out a type of con-struction to meet this requirement. Stations of this type will be built in the conter of every hick on Wabash Avenue, and the platforms will be but a short distance below the sidewalk level. Underground walks will afford opportunity to cross the streets, or wans will amore opportunity to cross the streets, or o walk parallel to the car line, past the basement indows of the department stores. The cars will include the most modern improve-

The cars will include the most modern improvements, such as side entrances, to permit the rapid handling of passengers, provided with automatic signals to show the molorana when all the doors are closed. The use of these cars will greatly reduce the length of stops at stations. The plans also provide for the bousing of all underground utilities in suits chambers. Berry public service corporation will have its own chamber, as shown on the freed-pass agraving, in which will be accommodated all of its pipe lines when the property of the provided of the property of the provided provided the property of the provided provided provided the provided pro will be taken to provide for the future water supply, a very vital provision in the consideration of the future needs of the business district. These chambers will be easily accessible from the street surface, so that it will be a simple matter to imspect or repair the pine lines of any company. The cost of this gal-lary construction has been included in the foregoing figures, so that an expenditure of one hundred and twelve millions of dollars will give Chicago a com-plete traction system, and the best possible provision

for her public utilities.

This comprehensive plan is the outcome of severa months of investigation by City Engineer John Eric-son The result is a scheme of construction that is well adapted to meet the peculiar needs of a city well adapted to meet the peculiar needs of a city that has its entire bushess interest within an area of six square miles. Whatever slight variations may be made in the plens during the progress of con-struction the scheme for construction as here de-scribed will be the general foundation for whatever suhways may be built

The (prent implement.

The current Repplement.
The Garratt Retailer salined becometive is the subject of the opening article of the current Surrayara. No 1785 The salient features of the locomotive are its extrema facibility and adaptability for operation on steep grades and sharp current The mining tungaten ore is described by Consultar Agont Harry A. McBrids, of Bilboo From the beginning, Amaritan agriculture has been characterised by its extensiveagriculture has been characterized by its extensiveness rather than its intensiveness Land has been more abundant than labor Prof Homer C Price contributes an article settlited "The Reorganization of American Parming" in which ha points out that the problem which now confronts the American farmer is to adapt his soil to present conditions. William E Start presents the first intentiment of a paper of Stark presents the first installment of a paper on "Measuring Instruments of Long Ago" "llo, a Third Universal Language," is the title of an article describing a nuiversal tongue which is instanded to take the place of Kaperanto, on which it is an improvement. Perf Raiph Baston Perry writes on the prophecy of Francis Bascon. A profile puppet-show can be made as described by A Rose Store new electrical and

physical apparatus are illustrated Prof & A Min-chen reviews some applications of microscopy to prac-tical science and modern knowledge The Difference Setween a Sanitarium and

The words "sanitarium" and "sanatorium" are popniarly understood to have the same meaning and are generally used interchangeably, when designating (or g) places of refuge for sick people but there is, in fact, quite a distinction between the meaning of the two words. In answer to a correspondent on this

the two words. In answer to a correspondent on this subject the Liferary Digast says
"The distinction between these words lies in the fact that they are derived from two different Latin roots. "Sanatorium" is derived from the late Latin roots. Sanatorium' is derived from the late Latin generatorius, meaning hardin joing. The 'erm relates specially to 'an institution for treatment of disease or large salarial benepacitic aerias or conditions peculiar to the locality, or some specific treatment, or treating patiental thesess. On the other hand, 'annitarium' is derived from the Latin sensites from some meaning shollow or sould 'Sanatarium' relates more specific solution of Sanatarium' relates more specific. cally to 'a piace where the hygienic conditions are preservative of health, as distinguished from one where preservative of health, as distinguished from one where therapeutic agencies are employed. Hence it is the province of a manitarium to preserve health, that of a manatorium to restore it. Care should be exercised in combining the proper vowels in these two words in order to indicate correctly the derivation"

In our issue of May 16th we published an article on the utilisation of wireless talegraphy in connection with a Chalmers-Destroit automobile in the Gild den tour Through insofverience, we neglected to state in the article that the wireless installation was gavined by Dr. Lee De Forrest.

THE CARTAGO RABTEQUARE.
BY PROF OUTSIAN RUGADO, CONTA BICA PATE COLLEGE.
On May 4th, at 6 50 P M, the city of Cartago, former capital of Costa Rica was wiped out of existence by an explosive earthquake which lasted but a few

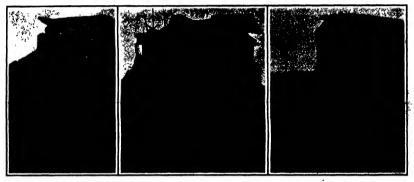
seconds The destructive motion was mainly vertical and began suddenly, that is, without the premonitory shorks which usually give most people time enough to run out from their houses. Immediately after the beavy up-and-down motion came a long series of smaller





A corner of the Palacie de la Pas

Ri Palacie de la Pas (Palace of Peace) gift of Carnegie, just completed.



A primary school.



Front lagade of the convent. Note the al-

boldly torn females and theory to

Scientific American

ere legt without shoiter. As the writer is seeding this redshite, (Mey Th) 170 corrises here been due out of the grint, Thet xubber is rapidly increasing to himper of the wearded is not yet known. They are certed daily, he special truits, to find José The destinction and suffering are lintone. Persons who with to halp may do so through the American isopation in

During the year 1909 small earthquakes in Cartago Diring the year 1899 small earthquakes in Cariago d been rather frequent, and the writer, who had seismograph in the Cartago College, began to send spilar reports to the recently founded Strasburg Cen-al Bureau of the International Association of Beishad been rat Itsel Bureau of the Interestional Association of Seize-niselezy. On April 13th, 1916, shortly after midsit-seme a first warning of the impending extastrophs, the form of a series of estruquiates, the third of thich financial many house, destroyed some poorly mit walls, and played great horse among bottles and seasons of the series of the series of the series was appeared to the series of the series was also because the series of the series of some three to appear and the series of the series of some three to appear and the series of the series of some three to appear and the series of the series of the series and pushes because alacuned, and exceted in the streets and pushes parks testes and sheets, in which they step!

NOW TO ACT IN CASE OF FIRE.

at reser coulies.

Perhaps no single ejaculation is capable of producing so instantaneous and so widespread an alarm as the cry of "Fire!" Nor is this surprising when we remember that the fire fiend is each year responsible for an almost incalculable loss, both of life and of

Yet of all emergencies, none more than an outbreak of fire imperatively demands a preservation of one's power to act with coolness and decision Often, by prompt and well-directed action, the threatened cutsu trophe may be averted, the loss of property and what is still more important, the loss of human life, may

be avoided Fire drill nonedays has its place in the routine of every well-conducted avoidable establishment, nor intelligent either than the second of the route of young people of both serse has, it emergency, proved the means of preventing asystaling disaster. But while this capacity for combined action is very desirable, there seems no be a diagnor of fostering in at the expense of what one may term "fire education"

tor's head, but the carbonic-acid gas with which the water is charged helps to deaden the flames. How to act for one's safety, or to assist another,

in the case of burning clothing cannot be better told than in the words of Prof John Marshall He says "If the dress of a woman catches fire, she should at once lie down on the floor, and should (rawl in this position either to a beil pull or a duor, and call for assistance, or she should roll herself in a rug or blanket in the event of a man rendering help he should at once lay the patient down take off his and roll her in it, unless he can obtain a highest or rug or roll her on the carpet. If a woman ronders ciothing to touch the victim, but to hold a rug or blanket in from of herself white approaching the

Prompt action without rashness or self-balki hnrry, is the keynote of success in fighting the fir-fiend. This applies repecially to those who wak, from fiend This applies reperially to those who wask from sleep to find the house on fire. Not a monited should be lost, but there should be no wild rushing from a window to a door and back again. First an attempt should be made to got down the stairs. To escape through passages filled with auffocating smoke, tie a



Bineing off from overturned lamp extinguished by





To avoid drawing burnt or scalded limb from clothing out appaired away with sharp sciences.

Manner of tring sheets, etc., together to form an escape rope





4



Method of using knotted blanket or sheet rope for escape by windows.

Crawling method of escape from passages tilled with smeke. Handkerchief helds wet sponge in place.

A syphon makes a handy and an efficient fire extinguisher.

shocks had somewhat decreased in number and in-

tensity when the fatal issue came.

Cartago is situated at an altitude of 4,700 feet, at the very foot of the huge voicene Iran, which towers 11.500 feet above see level. The Iran voicene is considered as extinct, the only remnant of its former activity being a few fumerolles or steam jets, located alderable distance from the new silent and cold craters. At no time before or after the estastropi craises. At no time before or after the extestrophe have the funanciales shown any arraptom of increased activity. Moreover, the asimograph, in Cartage gave for most particulates a direction which was almost purposedistia; to that of the viplano. Therewere, after the destructive shock, the direction of the outbornakes because variable, and for fione of them confided with that of the Trans. On May 44 the needle of the apparatus began writing the last chap-ter of the drams, and while so doing jumped out serour or the strains, and while so dering jumped out served times from the giase plate. Then the selemo-graph, which is a heavy invested pendulum contained in a box some three fact high, was violently thrown against the wall; the giase plate thi from its shelf,

against the wall; the gram are and we broken in the same and we broken in two. Among the public buildings which are in ruins in the benutiful Philos of Piece, & just of Mr Andrew Corporer To Repelace had yout been completed, the in-

and experiment, what to do when a fire breaks out in his own house. He should be instructed how to go to work coolly and methodically either to extinguish -if necessary—to escape from the Lessons of this bind, imparted by practical meth-ods, would become a source of strength in after life and would go far to check the recurrence of fire out

NOW TO ACT IN CASE OF FIRE.

hreals, with their entalled loss of life and capital Take, for example, the case of an overturned oil There is a sudden and alarming biaze, but if action is taken at once, the damage may be confined action is taken at once, the damage may be confined to the extract, either or what not upon which the lamp actually like. To thorw water on the confineration is useless. The birarian coll will either the force of a larger area. The dam should be to abour the oil and mouther the fannes are most as possible, and this may best to done by means of some son-finemable provider—done is flow, sand, earth from the garden

powder-such as Bour, and, earth from the garden or anything of the kind Another point worth remembering is the use of the sode-water ayphon as an extinguisher Suppose that a kump or candle has ignited a curtain and that the a mmp or cancus mas ignited a certain and that the finner has run up the fabric. A syphon or sook assier held as shown in the accompanying photograph, and squiridd over the fiames, will work wonders. Not outly does the force with which the liquid issures the table above of its being directed well above the operawet handkerchief over the mouth and nose then crawl on the hands and knees, for the smoke tends to ri-with the hot air and will be less dense close to the

But if the whole of the lower part of the house is burning and cscape by means of the stairs is impossible preparations must be made for leaving through the window. The all the sheets and biankers together by means of 'reef knots which will not slip no by means of 'rev'knois which will not slip no mait ter how much strain by not upon them. Then drop the bedding or maitress from the window in order that there may be some kind of break in the event of a possible fall. Plinally make one end of your improvised fire-examp fast to the bedpost drop the other end from the window, and after making sure that it ranghes to or almost to, the ground go down it boldly hand over hand. It should be added that in the case of interesting dispresses there is a second to the case of interesting dispresses them. of inexperienced persons there is always considerable risk of a dangerous fall resulting from this means of exit, therefore it should be undertaken only when all

other means of escape have failed
In conclusion a few words may be added r ing the treatment of burns and scalds prior to the arrival of a doctor. The main point to bear in mind is that the air is to be excluded from the affected part as quickly as nossible This ma This may be done by

HEAVENS IN JUNE THF.

BY HENRY NORRIS RUSSELL, PHD.

UNE, though less exciting from an as-tronomical standpoint than May, is still a month of more than usual in-

Hailey's comet will, of course, still Halley's comet will, of course, still be the main object of attention. At the beginning of the month it is cellently placed for observation, about midway between Regulus and Alph-

midway between Regulus and Alph-nard (cf. Hydrase) on a dark sub-setting after 11 P M it will how-ever be much less compleuous than the week before, and will seem to shrink and rade rapidly as it recedes and will see from us. Its distance on the ist is about fifty million niles, and this increases steadily, at the rate of three and one-half million miles a day--to which the earth's motion in one direction contributes about one and one-half million miles, and the comet's motion in the

posite direction the remainder its apparent motion in the sky is slow, for it is

moving simust directly away from us it still travels castward and southward among the stars, continuing the line of its cariler path but very much more slowly. covering only 13 deg dur-ing June, and 5 deg during July

During the first ten days of the month it will still be a fine naked-eye object. Then the new moon will begin to flood the evening sky with light, and drown sky with light, and drown it oul By the time she is out of the way again the comet will be 125 mil ilon miles from us, and equally far from the sun, so that little can be seen of it without a field glass.
With the aid of the latter
it can probably be followed all through the

The display which this comet has given us dur lng May is probably the finest of the last fifty Venn

Curiously enough, its ter-century is the great unexpectedly last January This was at one time much brighler than Hal-ley's comet (owing to its (lose approach to the sun) but its tall was not so long and it was too deep in the evening twilight to be seen to the best advantage

Daniels comet of 1907, though intrinsically of about he same magnitude as Halley's comet, was never within fifty million

miles of the carth, and so never afforded nearly as fine a spectacle

Back of this is a long barren interval. The last previous counts which was at all conspicuous to the naked-ye was the great one of 1882. This was one of the grandest ou record, and had a tail over 100 nvillion miles in length but this was directed almost away from the earth, so that it never looked more away from the earth, so that it never looked more than 5 deg long—as against over 80 deg for Halley's comet before it left the morning sky Before this comes Coggains comet of 1874, with a tail of 80 deg long but the last comet, fully comparable in appearance with our visitor of this year, is the great comet of 1861, whose tail was at one time 190 deg, in appearant length As in the present case, the earth passed through the tail without any sensible effects other than a general illumination of the sky on the night of passage. Three years earlier, in 1854 on the night of passage. on the night of passage intro-years earlier, in 1806, appeared Donati's come! by common consent the finest of the last half of the nineteenth century

of the last half of the nineteenth century Several of these comets, especially that of 1883, were really much largor affairs than Halley's, but the very favorable circumstances of the present rewere really much larger annirs than Halley's, but the very favorable circumstances of the present re-turn make it comparable, as a specialit, with any of thems, so far as can be judged from the records "The last nows at the moment of writing is that its

ad proved perfectly transparent during its transit across the sun, and that its tail is so much curved in its own plane that the earth did not reach it till long after daybreak on the 59th Before dewn this morning it was a magnificent object, extending from the asstern horizon half way across the sky, till it was look in the Mility Way its total length up to the invitable head was rully 13e deg., according to be convertaints here, and 16 deg as seen at the Liok Observation; a few the REAL STATE of the STATE ng after daybresk on the 19th Befo

higher still the Little Bear, standing poised on its tail above the Pole Between this and the Great Bear are the long coils of Draco Our initial shows the truly formidable aspect of this monstor, whose form, coils and all, can be traced with decided likeness among the

the Crow and One resting upon his best, Singler down below Virgo, are many of the stars Centaur and the Wolf. Observers in low is near the tropics, one see below these the two est stars of the constellation which, though am cut stars of the constellation which, though among most brilliant in the heaven, have no Greek, Lai or Arabic names, being too far senth to be knot to the ancients. The easternment of the two, Africantus, is known to all students of astronomy. our nearest neighbor in the heavens—only

nant.
Farther east, and best seen a little earlier in the evening, is the Bouthera Cross.

Lao, in the wort, and Cannor and Gemini below, complete our list. This region of the sky will be the closest watched of all during the month, for the complete our list. is there.

THE PLANSES

Mercury in morning star all through the mostle, being best observables about the time of his greatest elongation on the 19th, but as he is then south of the sun, and rises little more than an hour before him, the pres-ent opportunity is unfi-

vorable.

Venus is likewise morning star, rising be-fore 3 A M and very con-

in Gemini and Cancer, setting more than two hours later than the sun. Jupiter is in Virgo, Jupiter is in Virgo, visible all the evening. He is in quadrature on the 27th, and comes to the meridien at 6 P M

Saturn is morning star in Aries, rising about B A. M in the middle of the month On the more ing of the 5th he is in ex-tremely close conjunction with Venus, the two being only four minutes of arc apart-too close to be separated by the unaided Unfortunately, the eye. Unfortunately, closest approach is about 9 A. M by eas standard time, when planets are invision the in be daylight, az d they will be about a quarter of a degree apart at 3 A. M., when we can last see them Observers on the Pacific coast will be able to follow them until they are almost too close to be

are almost too close to be separated by the eye.

Uranus is in Sagit-tarius, and crosses the meridian about 2 A. M. in

meridian about 2 A. M. in the middle of the month. Neptune is in Gemini, too near the sun to be observed. The moon is new at 8 A. M on the 7th, in her first quarter at 11 A. M. on the 14th, full at 3 P. M. on the quarter at 11 A. M., on the 16th, full at 2 P. M. on the 12th, and in her last quarter at 11 P. M. on the 29th, 18th is nearest the earth on the 8th, and further away on the 18th. Is her organize pround the bases away on the 18th. Is her organize pround the bases she peeses Vesius and Batters on the morning of the city, very closely. These conjunctions, like that of the planets two days labor, keepon after the still have weetern observers. It was not the 18th, Mark on the 18th, Tepher on the time on the 18th, Mark on the 18th, Tepher on the 15th, and Uranus on the 26th, mass of these deserge.

The adultion of interprint to conter still it is possible to content and extend to content and white contains after per sons and sone of a district and the content and it is


MIGHT SKY: MAY AND JUNE.

stars themselves. The two bright stars β and γ in

stars themselves. The two bright stars \$\tilde{A}\$ and \$\tilde{\gamma}\$ in the Dragonia has deal are very completee a. Two others, of which only one is shown on the map, make up with these an irregular quadrialses.\text{M}\$ The fainbest star of this, \$\tilde{\gamma}\$ Dragonia, is an interesting double, separable with a sheldgiages of high power—the distance of the components being almost exactly one minute of arr The star \$\tilde{\gamma}\$ Dragonia, about midway between the bowl of the little Dispers and the end of the handles of the Great Dispers, in networthy as the polaries of the Great Dispers, in networthy as the polaries of the Great Dispers, in networthy as the polaries of the creatial polaries. About the var \$860 \text{ Lost}\$ the creatial polaries are the star, so that it doubt the stane place in the heavens then that Pelarie does to-day

In the northeast we see the great cross of Oygnas, and the brilliant Vegs, and due east Atlaft has just frees. Higher up is Hercules, and seets of him Ophitochus, entangled with the Serpent which he carries. Boddes is right overback, Arctérus being seens 20 deg. south of the smith. Low in the southeast is Scropio, not yet right versioned. Other right send above in the instgnificant group of Liters, and the extensive in the fantgnificant group of Liters, and the extensive one of Yrays, any brightness of by Junjuny. In the count of Yrays, any brightness of by Junjuny, in the count of Yrays, any brightness of by Junjuny, in the count of Yrays, and predefined the singlety height of the county of t

Total Control A CLOSE SECT. THE LABOR DESIGNATION OF

s of the "Dr These have been many mediatetions of the "Dread-negate" design since it was first introduced in 1905. he American medification is distinguished by the most-line arrangement of the gun turrets, the German eful secondary armament and by the re-duction of the triple turret. It has resained for italy—the home of constructive genius and he real birthplace of the dreadnought itself—to com-tine in one ship the twin turret, the triple turret, and

the cooler-line arrangement.

"Pour abbr as well as the construction for the Meditor-reness power 900, the "Duate Alighiest" was ladd fewer last seamers, and is to be leanning the seamers, and is to be leanning the seamers of the seamers, her power has been seamer as the seamers of the sea

they were to carry eight 14-inch guns. It sow turns out, however, that they will have no fewer than thirteen 12-inch weapons. This is a larger number of sin-gle-caliber guns than has sver been mounted in a modern ship, although the Japanese "Satnuma" and "Aki" such carry four 12-inch and ten 10-inch, to earry four 18-inch and ten 10-inch, to say nothing of twelve 6-inch The ar-rangement of the guns in the Italian ships in distinctly novel. There will be three-three-gun turreta, one forward, one att, and one amidships, while a twin turret will be placed forward and aft, so as to brink its guns to bear over tha lower turret. There will thus be a roit ide of thirteen 12-inch guns, w

aronatore of intressur 15-inch guis, white a forwards 4.7 fire of five 1 The secondary battery will consist of sighten 4.7 inch rapid-fire guns, besides the same number of 3 inch. Three under-water torpede tubes will be fitted. The displacement will be 24,000 tons, the main armor belt 13 inches thick, and the speed 22 knots

and the speed 22 knots.
The arrangement of the armament in the "Dante Alighier" is precisely the same as that in the other three skips, ask that its midsholl parret is appressed, and that the affer turrets are on a lower level than those forward as will be seen from the accompanying aketch, the desk runs straight from low to stern in the three other skips. The "Dante" will have a displacement of 18,500 cons and a speed of 33 knots. The four akips are to be completed in 1911.

BOW THE LAKEVIEW GUILES WAS CAPPED.

Last week's issue of the Scientific Augs tained a description of an oil well in the midway dis-trict near Bakersdaid Cai, which on March 15th aud-denly blew out the drilling tools and became the Lake-

Gusher, the large oil gusher in California. oil gushor in California, blowing out at the rate of over 40,000 barrels of heavy crude oil a day Tha force of the gas pressure was so terrific that the derrick was ripped to pieces, and oil spray was every direction. How to problem. For egyeral weeks no attempt what-ever was made to check ever was made to check the flow. A tentative at-tack was then made to fasten down a wooden roof over the head of the well

ough the roof was n nade of 16 by 16 timbers, the

gusher tore them to splinters.

The following plan was then successfully adopted.

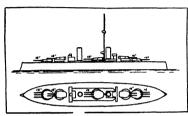
The gusher had by this time broken out in several The coloring pain was ten sections of the section of painters believed by read and said. A steel-side of heavy phasts was then hell second the specialty will. The walls of the stockade were if feet light, the one side of the stockade were if feet light, the one side of the stockade were if feet light, the one side of the stockade were if feet light, the one side of the stockade were if feet light, the one observed the stockade were in feet light on the section of the stockade were the stockade in the rearway like a thing of the stockade were the stockade when the section of the stockade of the stockade of the section of the stockade of the stockade of the section of the stockade of the section of the stockade of the section of the section of the stockade of the section of the section of the stockade of the section of th

Scientific American

bies, which had served to hard up the raft, were then made fact to berief pipes. The result was that the stream of oil was haried against rhat was virtually a raft anchered in midair. The raft, held up by the force of oil, is about 15 feet above the mouth of the well and just above the etockade. Although this force ont actually sitellie the grash of oil, it has very much lowesed the height of the fountain, and thus has re-sulted in a wast asking of oil.

A National Good Bonds Laboratory.

A National Good Bonds Laboratory, The Agricultural Appropriation Bill approved March 7rd, 1818, contained an item appropriating 10,000 to enable the Secretary of Agriculture to make out the United States, to make investigations in re-gard to the best methods of road making and pro-pare publications and sasist agricultural colleges and speciment exitous in disseminating information on



NEW ITALIAN BATTLESHIPS WHICH WILL BE THE FIRST TO CARRY THIRTER TWELVE-LINGS GUES.

this subject. In pursuance of this authority, the Of fice of Road Inquiry was established During the next two facel years the appropriations and the wording of the hill remained the same The appropriate for the facel year. 1857 was reduced to \$8,000, and a provision was added authorising the investigation of read-making materials in the several flattes. The appropriation requision \$3,000 annually. States. The appropriation remained \$5,000 annually during the facel years 1888, 1899, and 1900, and no change was made in the wording of the hill, although the name of the effice was changed from "Read Inquiry" to "Public Road Inquiries" in the facel year

The Agricultural Bill for 1901 carried an appropri-ation for \$14,000 and provided for conducting experi-ments in the city of Washington and elsewhere and ments in the city of washings and enserter and collecting, digasting, reporting, and illustrating the results of such experiments. The appropriation for 1903 was \$20,000, and the bill provided for the in vestigation of the chemical and physical character of road uniterials. The language of the appropriation work of the office is divided into three hranches, namely, the laboratory work, which is organized as the Division of Tests, the engineering work, which is known as the Highway Division, and the economic, statistical, road management, and miscellaneous work which is organized as the Division of Road statistical.

Management.
As the Division of Teeds, which may be regarded
as a National Good Roads Laboratory, is considered
to be the most completely equipped read material
laboratory in the world we give the following detailed description of the plant and work: The Assist
ant Director and Chemist has charge of the Division
of Teels in the has as has sealistant a testing engineer
and an assistant chemist. The chemical laboratory
is under the immediated dreve tion of the assistant emist and the physical testing of materials is under chemist and the physical testing of materials is undar the testing engineer. There is also in the Division of Tests a petrographic laboratory with a petrographer in charge. The routine testing of ma-terials conducted by the Division of

Tests consists of microscopic and chemi est analyses of specimens to de their mineral composition and proper their mineral composition and proper classification, and physical tests to deter-nine their comenting value hardness, toughness, resistance to wear, water absorption, and density (Builetin 79 Bu reau of Chemistry i

in addition to the roulino tests spe in addition to the rounds teem appeared to the collasticules are made regarding the use and composition of asphalts, oils, tars, compounds various emulsions, and sait solutions, with the view of preventing dust and preserving road surfaces (Butictla Nu 34) Other investigations in clude research into the decomposition of rock nowders (Bulletin No. 28 Circular No 38 and Farmers' Bulletin No 239, Circular No 38 and Farmers' Bulletin No 239), the testing of clays for use in paving brick burnt-clay and sand clay roads (Bulletin No 27 and Farmers Bulletin

No 311), and the corresion of iron cuty rts bridges fence wire t Bulletin No 30 and Farmers' tiu No 2391

sent for the physical testing lab is an follows

Large impact machine for testing paving brick, impact machine for testing bluding power of rock dust, impact machine for testing the toughness of rocks, Olsen testing machine for tensile, cross b ing and compression tests, capacity 2,009 pounds, Richie testing machine for testing tensile cross-bending, and compressive strengths capacity-200,000 pounds, delicate platform scale a, byfamile machine for molding briquoties, torsion balance, abrasion ma rhins for testing resistance to wear of rocks, vacuum pump, dismond saw and grinding laps for making thin rock sections for interescopic examinations, ball mili for grinding rock samples into powder centrifu gal pump, dismond cure drill small rock crusher, grinding disk for testing the hardness of rock sam ples, battery of pebble mills for pulverising rock pow ders. Westinghouse all

compressor, hot air batb, gas furnate, and a cum picto cement testing outfit consisting of a Fairbank a torsion machine, Gil mores needles, standard sleves, hriquette moids, soaking tanks, etc

soaking tanks, etc.
The equipment for the
machine shop where test
ing machines and other
apparaiss are made and
repaired is as follows.
Showd lathe, on gine
lathe, drill press, power
hack axe, prevision lathe,
saw table, mincress triumer.
The chemical laborecessary chemical gapa-

ratory is equipped with the necessary chunical apparatus used in making analyses of rocks (lays cements, and hituminous substances it is provided with compressed air vacuum, gas, hot and cold water steam, and electricity. The petrographic laboratory is provided with a petrographic microscope of the latest Fuess model, which besides the usual attachments is Fuess mode, which besides the usual attachments in provided with a revolving analyzer in the tube to aid in the determination of very low doubly refracting mineral, and a Schwartzman scale for the measure-ment of optical axial angles. The methods used for examining and classifying rocks are fully set forth in Bulletin No 31

The road material laboratory was established in December, 1900 and from that time until November 30th, 1908 3 018 samples of road material nere tested from practically avery State in the Union. The results of tests made up to January 1st, 1908 and a brief description of the present methods of unking routines. tests are shown on Form No. 28



ARRANGEMENT OF STOCKADE AND RAFT WITH WHICH THE LAKEVIEW OUSHER WAS CAPPED

bilis has remained practically nuchanged up to the present time, except that the name of the office was changed from "Public Road inquiries" to the "Office of Public Roads" and a statutory organization was provided in the Agricultural Rill approved March 3rd. provided in the Agricolitaria isini approved Merch 3rd, 1905 in the appropriation bill for 1909, the rent or purchase of road-making machinery was forbidded. The total appropriations to the fixeal year 1909 inclusive amount to \$473,40 The estimate for 1909-10 as approved by the Secretary of Agriculture is for The Office of Public Roads is under the jurisdiction of the Mational Department of Agriculture as shown above. It has no administrative duties and exercises

apore, it can no administrative curies and exercises on control whatever over the reads of the United States, its functions being entirely scientific and educations. No appropriations are made by the national parameters for roads except on government reservations. A the present time there are sixty-even off-



NEW TWO-CYCLE MOTOR'S

DEFECTS OF THE TWO-CYCLE ENGINE AND HOW THEY ARE OVERCOME

A belief is growing among gas engine experts that the greatest improvements in gas and gasoline motors must come in the future from some type of angine which gets increased power from its cylinders eliminating the idle revolution of the four-cycle If is conceded that four-cycle design has practhally reached the limit of its possibilities the advent of the automobile having drawn the services of the brightest men in the gas engine field, the result of whose work is seen to-day in the splendid examples of gas engines found in even the cheaper kind of autoof gas engines found in even the cheaper kind of auto-mobiles. However many designers feel as was er-pressed by one prominent engineer, that "It is incon-civative that the four-stroke cycle with its small ultisation of one-half of the pitton strokes will be accepted as the finality of development, the two-stroke cycle as now applied in country unsatisfying for resonus that are femiliar to all students of the question."

It is apparent that the chief efforts toward improvement are now being made with a view to eliminating the defects heretofore common to the two-cycle type The (hief defects of the usual two-cycle engine may be summed up as follows

i The explosive mixture is taken into the crank case resulting in leakage and in possible explosions

2 The new charge comes into direct contact with 2 The new charge comes into direct contact with the hot burned games, causing possible pre-ignition and some loss of gas at the exhaust
3 The charge is not large enough in volume be cause the crank (age is an altogether inefficient com

pressur on account of its very large clearance. This means a small charge and also a large percentage of

dead gas left in the cylinder

4 The power is not increased materially by the double number of explosions because of the weak

charges and poor economy

Several recent two-cycle engines most these defects several recent two-cycle engines most these detects in different ways. The Newcomb engine was recently exhibited before the Automobile Club of America. This is a two-cycle engine using the crank case to supply alt only. This air blows out the previous charge and hurnlanes oxygen to hurn the next charge of fuel. The fuel is injected directly into the cylinder from a The hin is injected directly into the cylinder from a phinner jump, the quantity being controlled by resu-lating the stroke of the jump. The gastoline is directed downward into a small cup on, the bend of the piston. When the platen rises this cup or pocket is in the vicinity of the gawkr plug so that there is always an ignitiable mixture near the plug even when running on very light lead. This arrangement avoids several on very light load. This arrangement avoids several of the defects of ordinary two-cycle engines. The rharge is limited, however by the amount of air which can be supplied from the crank case, which would scarcely exceed 75 per cent of the displacement. of the piston, leaving the other 25 per cent and the clearance space filled with burnod gas. This engine rearrance space nine win ournou gais "ins cagine will indoubtedly be more powerful, economical, and reliable than the ordinary two-yele motor. Another improved type of two-yele engine is that employing a differential piston. This engine leaves

out the crank case entirely as a means of supplying

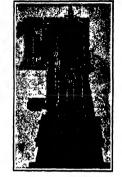


Fig 1.-Shortt two cycle motor.

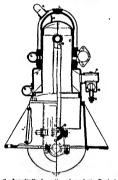


Fig. 2: - Longitudinal section through the Bruderick

the charge or air and compresses the charge philiality an anniar chamber formed by a differential er an anniar chamber formed by a differential er and disnessed piston. Two crytisches are worked seguite the lower piston. Two crytisches are worked seguite the other This permits petting a full charge large capacity, though the loss of fast through large capacity, though the loss of fast through schaust is itlady to be greater. The junkage ions base friag are eliminated. This type of motor is so the Mimore actionable and a tight-weight may weighing but 3½ pounds per horse-power and structed after the design of J W Broderick is to being manufactured for aeroplanes and other secu tic purposes.

A good idea of the method of operation of this m can be had from the diagrams we reproduce cross-section of one of the cylinders shows the is The cross-section of one of the cylinders shows the large compressor plating on the lower end of the working platon O' On the down struke the large platon draw in a charge of gas from the eacherster through the presses this charge in the chamber F show it and in the pipe of leading across to the listed port of the sec-oud cylinder Just before the piston of the second cylinder costs the ashaust port, it uncovers the Inick port O and the charge compressed in the transfer pipe OF I senting from cylinder one to cylinder two, passes into the cylinder and is directed upward by the defie

from mack area in the orank case, which sometimes cause serious damage

The new cycle motor is a recent invention of C A.,
Dawley, member of the American Society of Mechanical Engineers This engine has some feature of both
of those described above it uses a differential pistore of those described above it uses a differential pixton and handles the charge in an annular charaber, but it also compresses air in the crank case. Owing to the enlarged diameter of the piston in the crank case, the air supply is in access of the piston displacement. The are supply is time sceene of the plane displacement. The art displaces the exhant and accurage the rylinder before the new charges is admitted. The admission of the new charge is controlled by the value P in Fig. 5, and the timing is such as to introduce the charge after the cylinder is cleared of borned gases, but before compression commences. This evidently will give a chil charge of all and fice is and prevent any loss of fuel or premature ignition. When used on gasoline this engine may use a carbracter, in which came an entire rich mixture would be drawn into chamber 3, while the additional air required for combustion would come from the trank case. Or a freel pump may be accepted to the charge of the c

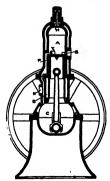


Fig 4 - Section of Dawley engine.

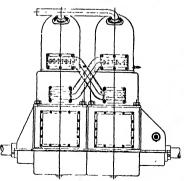


Fig. 3.—Side elevation of Brederick two-cycle ner-NEW TWO-CYCLE MOTORS.

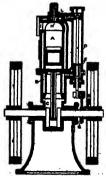


Fig. by Section of Bandon engine.

A BOUGH AND READY GALVANIC BATTERY.

The best battery for experimental work in the work-The one taking for experimental work in the work-hep or laboratory is one of the rough-and-ready type pat will give a moderate current of stectricity of y three or four amperes with an electromotive force L5 to 3 volts. Such a battery is suited for the exting of a powerful electromagnet, for magnetizing irposes, operating an induction coil, and for electro lver plating, electro brazzling, or slectro coppering giver piating, electro brassing, or steetro coppering either by the hot or cold process, and for electro gild fag. The following description will enable anyone who can bandle woodworking tools to construct such a battery consisting of two cells capable of being coupled so as to give the current of one large cell or In series so as to yield the current of one cell as pa series so as to year as current or one en and the electromotive force of two. This inter plan is the one best suited for coppering, brassing or electronickeling. This type of battery has been used, and is still used by the writer for all the purposes men tioned, for over five years, so it has been put well to

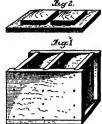
the test of experience

The wood used in making the battery must be ther
oughly well seasoned. An old board that has been kept years he an office or a loft will prove the thing required. The board should be 1 into thick Cut a strip 5 feet long and 8 inches wide. Plane this smooth all over and then cut three pieces 13% inches long, and three pieces 5% inches inog. The inter will form the ends and central division of the bat will form the ends and central division of the bat tery. The side pieces must be growed so as to re-ceive these pieces with a very nice fitting joint as shown in Fig 7. The bottom piece must be made as shown in Fig 7. with two pieces of wood cut exactly 5 inches square, this aise being the inside measure-ment of such cell i These squares must be held in place by means of screen that are inserted from the underside of the bottom board and pecetrate to with 1.2 Lendred the series nursice of the squares. The in % inch of the outer surface of the equares should also be costed with a thick shellar varish (not glue) before being fastened in place. The grooves in the side places and the ends of the division pieces the side pieces and the ends of his division pieces must also be well coates with thick shells, varnish, after which the pieces should be driven tightly to grither and held by nails or acrews. Nails driven disponsity make the best job because they will draw the woodwork together more firmly than screws, and resist direct strain better. The object or using shell

the woodwork together more firmly than serves, and resid direct strain better The object of using shel lac is to haure a perfect scid proof joint, and the f-inch square pieces where presed into position form a bottom so firm that no scid flquid will posentrate When the battery has been put together it must lined on the itsade with a costing of hurning hot pitch. Use and offs surveyant form the pitch in Your some into one of the crist and tilt he battery first one side then another until all four sides have been one side then another until all four sides have been submitted to the hot plich. Pour the pitch back into the saurepan, take a strip of square or flat iron, make and around the joints at the bottom, so as to secure and around the joints at the bottom, so as to secure

Scientific American

brass battery clamps to these with a strip of sheet copper folded over the top of the earton block. This is an Important Item. It use will protect the brass clamp from being corroded by the acids. The sine cylinders can be purchased with a copper strip and binding acrew attached. The sine cylinders must be amanagamated by doping them into suphrute said I part, water 8 parts, and then rubbing atl over inside and outside with quidealiver. Place these sines in the wooden vessel, likely up a mixture of suphrute could be according to the control of the protection of th



A BOLOH AND BEADY GALVANIC BATTERY

sium 12 ounces sulphuric acid half a pint. Allow this also to become cold. The battery is now charged by also to become cold. The battery is now charged by pouring the bifures attentioner into the porous poin, around the carbon blecks and then pouring the still putter acid mitture into the outside space around the sine cylinders. The battery is now restly for any put pose required and will keep in good action for about att bours continuously. When not in use the rime rylinders must be removed and placed into a stone-righter and the removed and placed into a stonecynners must be removed and placed into a atone-ware trock filled with water, and the bit-hromate init-ture must be returned to the vessel it was made in The carbon block can also be stood ou end upon blot ting paper or in a wide mouthed picks bottle. The sail phuric acid mixture can be allowed to remain in the woodon battery cells. For intermittent use such a battery will work well for months and meet every refor small work, either in the workshop or No amount of hard use will injure it, if Inhoratory well put together as described. No acid solutions will affect it, although the liquid may be left in the cells year in and year out

SAPE GASOLINE TANKS

SATE ORDITIE TARKS

To m, r was to me to mixture of gasline vapor with air *accidentaly ignited, of course)

I think the air in a gaudine tank could well by r
placed either by water or a non-addining as such as
carbon clastice, after the manner here illustrated
in the first two designs water is used in Fig.

1 the first two designs water is used in Fig.

the weight of the water forces the gasoline out of the lower tank through the stopes k B. The valve C is so constructed that it floats when the water reaches it, closes the opening, and thus prevents the water from flowing out. To reflif the tank with gasoline,

a sur tion pump is
consider to innected to the
stopcock A and
the gasoline is
siphoned into the tower compart ment through the stop-cock B The latter prevents the gasolino from



through the stop-

To make a plug connector for use in an electric light socket, all that is required is a hurned out inlight socket, all that is required in a binned out in-candescent lamp and a number of feet of heavy lamp cord Break the glass globo out of the lamp, leaving only the base Teen break savay the glass tube that protects the leading in wires, being careful not to injure them Now untvisit about a foot of the lamp cord, acrape the ends clean and slip a short length of rubber tubing owns can be all short length of rubber tubing owns can be all Jug 2.

mnort length of rubber tubing over each end Bolder the ends to the leading in wires in the lamp base and then push the rubber tubes down over the joints. Fill then push the rubber tubes down over the joints. Fift the socket with plaster of Paris, letting it project up above the top of the plug shout an Inch so as to form an insulated top to screw the plug in by This plug connector is suitable for small motors, portable lamps, and any other apparatus that draws only a small cur ront. It cannot be used for large currects as the heavy current would fuse the leading-in wires in the

A is closed and stopcock D is opened, and the water fewling out through the latter will draw the gasenlina into the inank through shopcock B. The railve B is adjusted to slink in gasoline and thus close the outlet, preventing samps of gasoline through the stopcock D.

PLUS COMMECTOR

A SIMPLE APPARATUS FOR EMPTYING CARBOYS

A very simple effective and agaily set up appear atus for emptying carboys of acid etc. may be made atus for emptying carboys of arid six may be made in the following way from materials found in v.vry laboratory. Dils will be found to be, far superfort los arid quot or the old-fashioned method of illi lar the carboy, catching the liquid in a jug, and the pouring it into bottles. For no feases can cause, and this is an important factor when deal my with a through a monoils or hydro horter and the way of the carboy of ing with serong annuous or nyurocontoric acid impirits of saits)

Say one wishes to fill with hydrochloric acid or

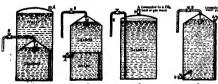
another figuid any number of bottles from a carboy
Fit every one of the bottles with two-ho ed tunber corks and then through each hole put a piece of class tubing bent in the form of a right angle with sides about three inches iong Connect one piece of glass tubing in one bottle to mather piece in another bot tie with a amail piece of rubber tubing the free piece of this boille with another piece in another bottle and so on intil you have all the bottles connected

up in one straight line
Connect the free tube at one end of the line with a pice of rubber tubing to a long bent glass tube passing to the beltom of the carboy

Attach the other free tube at the other end of tho rnw of bottles to a glass filter pump or any other surviou apparatus with a piece of thick wailed rub ber lubing. Then we have the apparatus as illustraled herewith

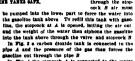
Turn on the water tap connected with the pump and the acid will be drawn up the tube leading from the earboy and into the first bottle. As some as this is filled the acid will run into the

som as this is filled the sild will ruit fillo the second bottle, and so on until the rarboy is empty or the requisite number of bottles are filled if one hasnt many corks all that is necessary is to fill say three or four bottles. When these are filled they can be disconnected and others put in their pince. But it must not be forgotten to turn off the water tap and so stop the flow of liquid be fore making the change



SIMPLE METRODS OF MARING GASOLINE TARES SAFE.

a perfect coating of pitch at these lottes. Now pour the hot pitch into the cell again so as to be sure that Il parts are well coaven. There the second cell in little stanner. Having the case now well put together, think the coating the parts are well again to the cell in the stanner. Having the case now well put together, think the case of the cell to the cell and pitch with the pitch the case of the cell to the cell and give quite a nice thank to the we'rk. To complete and the cell and pitch guide and the cell to t



gasonize out unrough the pipe S
In Fig. 4 the stopcock A is connected to the water
main or pipe when its pressure of the water forces the
gasoline out through the stopcock B. The valve C prevalus the water from excaping into the gasoline cans
through the stopcock B. To reall the tank, the stopcock



APPARATUS FOR EMPTYING CARROYS

if the liquid in the carboy is sulphuric acid (oil of vitriol) or any other liquid that attacks rubber the two bent tubes connecting bottle to bottle may or mane in one piece and it care is taken to push the each of the tubes below the end of the corks the liquid who t reach up to them and so they will not be hurt in the slightest. In fact no rubber connections may be made use of except from the auxiling pump to one end of the line of bottless though, of A glam filter pump is the heat to use because any

funes that may perhaps come over have no correcting effect on it, as they would have on a metal one

Scientific American

MAKING YOUR OWN PERSURERY.

BY A. S. ATKUM

The manufacture of perfumery has always seemed a difficult process to many, and without doubt the bleading of certain kinds of perfumes in a matter of much scientific and skillful manipulation, but on the much scientific and skillful manipulation, but on the other hand, the most commonly used perfuses can be made at home with simple apparatus and without much expense or trouble. In many parts of the con-try, flowers are so abundant that one can harvest all that are needed for manufacturing at home perfu ugh for a year's use

A perfume garden should prove as profitable as one A perfume garden should prove as profitable as one of fruits or vegitables. We plant gardens for cut flowers and for flower seeds, but flow rates flowers and for flower seeds, but flow rates flowers to perfume making. Enough perfumery is sold in this country annually to make a yearty tax of nearly the oddiars on every famility. This amount is not evenly distributed, but each woman spends enough to make it worth while, if she has the garden space One must devote time to the cultivation of certain

One must devote time to the cultivation of certain flowers which thrive luxuriantly in the vicinity in meny parts of the country roses thrive so luxuriantly that fields can be sown with them, and an abundant crop raised in other sections the rose is too slowcrop raised In other sections the rose is too slow-growing for this purpose, but the violet takes its place Again, it must be the jammine, the tuberose, the orange blossom, or layender. Whatever flower it is that thrives and possesses delicate but powerful fra-grance should be chosen for the work

Direct distillation is the most satisfactory way of taking perfumery. The still is a simple affair and making perfumery. The still is a simple affair and it can be made out of articles found in the average bothe. Take an ordinary tim oil can, scour it, and purify it of all oil dors 8000 the spout completely, and fit a cork in the top through which the oil topoured From a bardware store get four feet of coper ubing (tim or galvanized from pipe may also be used). The time should be both downward at the

The tin can should be filled with a pound of flo



HOME-WADE PERFUME STILL

petals gathered fresh in the early morning Pour over these petals eight fluid ounces of alcohol T the can in a saucepan haif filled with water, as on a stove, where the water can be kept at the boil-ing point. A hole should be cut through the cork of the cen just large enough to receive the metal tube. the can just large enough to receive the metal tube. Place a quart jar on a table nearby, and insert in it the other end of the tubing. This jar should not be sealed, or distillation will not go on properly When the water boils, the alcohol in the can is

heated, and this process extracts the perfume from the flower petals, and gradually causes distillation through the tube into the cold jar on the table. The alcohol thus distilled will carry with it the true attar of tha flowers. Alcohol has a peculiar property of extracting nowers Arcodo mas a pecuniar property for extracting and holding the scent of flowers. As fast as distilla-tion goes on, the contents of the jar should be emptied into glass bottles and securely corked and seeled with parafin in blending perfumes of several flowers, do the mixing after each one has been distilled sepa-

the mixing after each one has been distilled sepa-netty Do not mix the flowers in one still.

Another method of using this still is to employ
Another method of using this still is to employ
after vary cut have essential oil of the flowers, and this
rises and floats on the surface of the water in small
spholler, which must be skitumed off carefully, and
immediately bottled and kept cool and air tight
When samficient oil is obtained, it should be mixed with alcohol to retain the odor indefinitely. One may with alcohol to retain the odor indefinitely. One may distill with water any number of kinds of 50eers, and with the essential oil properly bottled, blended perfumes can then be made. A few drops of several kinds of oil are poured into a bottle containing a certain amount of alcohol, and when shaken thoroughly one amount of alcohol, and when shaken theroughly one has a delicious fragrame for home use. For instance, cau de cologne is made by pouring into a glass bottle a pint of alcohol, and edding haif a drachor of home-mede attar of rosemary and twenty drops each of the attar of orange peel lemon peel, and bergamot peel The distillation of these fruit peels is another desira hie home industry. Out up fresh orange or lemon peel and place if in water in the tin can, and heat as for use in flower leaves. The essential off of fless peels will then be gradually distilled into the other receptacle firm of the globules, and confine in corked bot-

Besides distillation, we have the process of absorp-tion, which anyone can do at home with little trouble and expense. It is slightly more complicated, but it will extract the perturn of more delicate flowers, such as the violets, with greater success. This process consists of covering two large shallow page or soun plates with a layer of melted suct. The layer should be half an inch or more thick. When the fat has hardbe half an inch or more thick. When the fix has hard-nod, gather the violeta, jamine, or toberone fewers, and cover the suset thickly with them Then place one plate over the other, and force down firmly. Wrap the plates tightly in paper, so that the perfume will all be retained in twenty-from hours the saset will have absorbed nearly all the perfume. Then quickly remove the dead potals, and replace with more fresh remove the dead potals, and replace with more fresh Repeat this operation for several days o once Ropeat this operation for several days or swe for a work, so as to secure a strong supply of odors. When compile betain have been robbed of their eder, remove the top lates and cut the such that mail pieces, and drop them has a wide-monthed bottle or the made as quickly as possible, and with least expo-sure to the air. Then close the bottle or jar, and seal with parafilm to make air tight As the seat absorbed the fragrance of the petals, so will the alcohol rob the seat of 11s concentrated extract. Every day the bot-tle should be shaken at 10th, and in a fortaight the bottles and content of the content of the petals of the bottles and content over the petals of the petals of the bottles and content over the petals of the petals of the bottles and content over the petals of the petals of the bottles and content over the petals of the petals of the bottles and content over the petals of the petals of the bottles and content over the petals of the petals of the petals of the petals of the bottles and content over the petals of the p bottles and corked

Besides making the liquid perfumes, one should co sider sachet powders and perfumed pastes. These have their use in every household. A rose paste is made by steeping rose leaves in water, and pounding with a mortar until reduced to a pasts. This macers with a mortar until reduced to a pasta. This mecra-tion should be thorough, and can be done with an ordi-nary rolling plu Now add a drop or two of your bome-made attar of rose, and permit the pasta to dry in an air-dight receptacle. The pasto will grow quite hard, and can then be cut into any shape desired A piece placed in a drawer will secent the place for a long time. If the pieces not in me are kept air-light they will retain fragrance indefinitely, and will always be ready for instant use. Ladd in lines and citotse be ready for instant use. Ladd in lines and citotse ses, they add that subtle fragrance to the fabrics

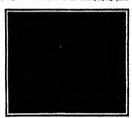
which so many like Sachet powders a which so many like
Sachet powders are as numerous and as varied in
fragrance as colognes. One may compound them out
of fower potals, splots, and partunes to suit individual preferences. The art of making seachat is very
simple and increposative. If we add to these stairs and
essential oils such simple articles purchasable at any
drug store, as ifer root, musik, and crechineal (the last
for coloring only) and and a spless as cloves, claims
moun, and glager, we have all the materials that a mon, and ginger, we have all the materies that a small laboratory requires for making a done kinds of popular wholes. Lavender seeds raised and cured at home side, a sachet situation for those who like this oder Another is manufactured by mixing iris this oder Another is manufactured by mixing iris of crees, the whole moletened with a little alcohel, and then rolled and kneeded into a parts, which in time grows quite stiff A free piscope of this distributed around in the clother press will add a delicious oder to garments. For gifts, appropriate bottles and ribbons or boxes may be purchased cheaply at the store, at the store, and the store will not defined and can be delicious ofter a six and damast can be obtained for concealing suchet or perfumed pastes, and pin cushions may be made and scented indefinitely by inclosing a good place of the perfumed paste in the center

AN EXPERIMENT IN SOURD.

Those who have had the good fortune to travel through a virgin tropical forest could hardly full to have been impressed by the death-like etilizes which have been impressed by the death-like etiliness which perrades all nature between the hours of 1 and 4 P M This is the thermal noon of these regions, when all life, weary with the battle with the terrible heat, seeks repose in a much-needed sleats. No sound is heard save perhaps the elight rusting of a leaf. or the plaintive grunt of a tardogradus as he answe the call of his mate, or reaches out for a new or

leaf with which to satisfy a never-ending appetite Under these circumstances Humboldt, the great G man travaler, who was camping twelve m the falls of the Orinoco River, was astor that no sound from this source reached his set, while sight hours their, during the night, when the weeds were rendered a perfect pandemonium by the spirited war rendered a perfect pandemonium by the spirited partner, stagar, and monkey, the sound of risking waters broke with astendating clearness upin his sur-What ta the explanation of this phenomenon? And why, for example, do the citizens of Weighington has no distinctly, at unjut, the heavy versits, spithery pass over the Fotomar railroad bridge, while starting a claim, examining day they intens in vain for the prime of the manking day they intens in vain for the prime of the noise of the day tradic masks the spended of the war-ten not settled, as althe superheave, of grantfields preven. Some light is thrown upon this problem, by a postpal that no sound from this source reached his sa

of the expedience of the business of the state of the expedience of the periods, there is not a part of the expedience of the periods, there is no the periods of where doep and I mense in manater, instantly yet hear an increase in the intensity of the sound, be-cause the column of air inclosed by such a bottle will wibrate the same number of times per second as the fork. Now hold a second similar bottle between the prongs of the fork, as in the accompanying photo-



AN EXPERIMENT IN SOURS INVERSERABLE

graph, and the sound is practically extinguished, because the creats of the waves entering one bottle coin-cide with the troughs of those entering the other Under these circumstances there is always interference, or allence Now introduce a piece of cardboard between the mouth of the bottle and the vibrating between the mouth of the botts and the vibrating prong, the conditions of interference are destroyed, and houdeses is restored. But an ear cloud is quite as effective as piece of cardiovard Place a burning match or a hot poker buesth the mouth of either one of the bottles, and as the thin layer of warm reaches the opening it acts as a curtain, reflects the sound waves, and instantly the loudence of the other in the condense of wonderful fact, the power of a thin layer of air to reflect sound quite as effectively as a board. Now, what are the physical conditions obtaining during the day between the ears of the citizens of Washington and the bridge over the Potomac Riv shining, the atmosphere is still, a hot stratu snming, the atmosphere is still, a hot stratum of air rises from a metal root, another alightly cooler from a grass plot, another of a different temperature from a concrete street, etc. Many strata of different tem-peratures intervene between the ear and the bridge. peratures intervere between the eir and the briggs, As we have just cheered the effect of one strend, we can readily realist that several would possess the power of complexity extinguishing the agins of the moving trains. At sight, on the confirmy, the sig is homospaneous, the wives sig unimpeded, and strict the current with assembling charmens. Bearing its mind those freat, many approprietly is explicable phenomena become as clear in the monetally

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NEW BOOKS, RTC.

DRAMENTAI CONTEXTE WITHOUT MOLDS.
By A A Houghton New York
Norman W Henley Publishing Company, 1910 16mo, 182 pp Price,
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By A A Houghton New York:

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Legal Notices



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One is the tildest agency for securing patents it was as a biblished over sixty five years age. MUNN & CO , 361 Broadway, New York Branch Office 525 F 51 Washington D C



INDEX OF INVENTIONS

For which Letters Patent of the United States were issued for the Week Ending May 17, 1910.

AND BACK BRARING THAT DATE [see note at end of list about copies of these patents.]



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The Latest s fast Freight Engi (Constuded from page 436)

miles. On these divisions there is a heavy movement of freight traffic, con sisting mostly of loaded coal trains. The e conditions on this portion of the grade conditions of this portion of the road are severe and sharp, curves are numerous. Against northbound traffic in which direction practically all the movement of loaded freight trains takes place, there is a six mile grade of 1 to per cent from Carbondale to Forest City From the latter point to Ararat, the sum mit of the rise, a distance of 14 miles mit of the rise, a distance of 14 miles the road is on a grade averaging 0 %1 per cent. Going down the other side of the mountain, it is practically a continu ous grade of 5:17 feet per mile for 7%

miles into Oneonta

Hitherio the freight traffic on this division has been handled by consolidation locomotives, having a theoretical maxi-mum tractive power of 49,690 pounds num tractive power of 49,580 pounds. A single engine of this class can very satisfactorily handle a 2600-ton train from Ararat to Omeonta, but it requires the assistance of two locomotives of the same class, as pushers, to hauf this load up the 20-mile grade to Ararat, at which point the pushers cut loose

with a view to reducing the operating expenses of the division and facilitating the movement of trains, the officials of the Delaware & Hudson Company dethe Disware a Pusson company of ided to investigate the efficiency of the Mailet type iccomplies for this service It was their aim to secure a pusher in more the maximum train load up the more the maximum train load up the bill with two engines instead of bree In the fall of fast year one of the heavy Maille engines built by the American Lao concile Company for the Erical Residual Sub-rowed, and put into pusher service on the 20-mile Arasat Red's A number of test runs were made, which proved that a single Erical Maille Lague could be sub-rowed and work of two Maille Lagues could be sub-rowed and the provided that a single Erical Maille Lagues could did the work of two of their Class E-5 consolidation locomo-tives Following these less the six Mai let engines were ordered from the Ameri can Loromotive Company, and put liste

design, embodying but slight modifica tions from the designs of previous loco-motives of this type of lesser weight, and power constructed by these builders With the boiler pressure of 220 pounds and driving whoels 51 inches in diameter. and criving wosels of inches in diameter, the theoretical maximum fractive power working compound raiculated by the Company's formula which is applicable only to articulated locomotives built by this company, is based on the results ob tained from a large number of indicator ars, taken under various service condi tions, it is found that the tractive power thus calculated represents very accurately the actual power that the locomotive an develop at a piston speed of not

These engines are of a straightforward

over 250 feet per minute With the companys system of compower working compound, can be in treased about 20 per cent by changing the engine into simple. The maximum iractive power of these engines working simple is thus 126 000 pounds

New Two-Cycle Moto

(Continued from page \$44)
compressed air which would then be fur
nished by chamber B to receiver D in is well understood that the high velocity is will understood that the night volucity produced by air under pressure is far more efficient in atomizing liquida than the comparatively low velocity produced by suction. This type of engine aboutd uce twice the power of a four-cycle engine of the same size and speed, and we are informed that tests now being made show this to be the case

Another engine using a differential pis ton but in an entirely different way in the Shortt Motor This engine com-presses air only in the crank case. Un like the others here described it does ot admit this air through a port opened (Concluded on page 450)

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In the June sauce of American Homes and Gardens there will appear, from the pen of the well-known sudher on Furniture, House Furnishing and Decoration, Man Eather Snighton, an article on "How at a Tombie to Obtan a Saul County House or Bungshow," also a Garage of the Naced-down Type, and a Beat House, for the relactionaly small some of \$2,000. That is not all Thoms are produced to the forced-down Type, and a Beat House, for the relactionaly small some of \$2,000. That is not all Thomshowl, with the cost of each article. Would pro believe that the amount named above suckades the entire cost of furnishing? But it also modules the cost of an automobile and of a moter boat! This is no fary tale. The article specifies the cost of the house, the games and the boat house, the cost of the automobile and of a moter boat! This is no fast place! In the supplement of the precision of the precision and the supplement of the article of furnishing, and each pice is illustrated, so that the reader can judge for hisself whether the object he cost of the process for a merupencie can such cost gate, and all to send for No family planning for an inexpensive names or costing should list to send for No family planning for an inexpensive names or costing should list to send for No family planning for an inexpensive names or cost gates and no one is fitted to speak on this subject with greater sutherity than the expert.

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(Concluded from page 440)

by the piston, but uses instead a valve which is vacuum actuated. The partial vacuum to operate this valve is formed When this platon reaches the bottom of its atroke it uncovers a port Q, through whith air enters and breaks the vacuum, whoreupon the vatve instantly closes. The fuel is fed from a pressure tank through a needle valve, and is deliv-ered at the need of the main inlet valve. As the pressure in this tank is greater than that of the inrushing air from the crank that of the inrushing air from the craik case, it forces the fool into the cylinder against the air pressure. It is claimed that the time the valve is open will vary with the appeal of the engine so as to let in the right amount of feel. The amount of the contract of th wo-cycle motor

Prof S. P Thomas recently stated be fore the Royal Society that he had suc coeded in producing a physiological effec by means of magnetism. A coil of wire was made 9 inches in diame m A coll of ognore 8 inches long, containing 38 turns Through this an alternating current of 50 cycles was presed, with a maximum 50 cycles was passed, with a maximum flow of 180 amperes, giving 5,760 amper-turns. In a dark room, when an observe placed his head in the mouth of the col-le could see a faint binish light, whist was not steady but appeared to fiction considerably. This could be observed



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(Concluded from page 440)

m with the eres closed. When the ex-linear was tried in broad daylight in the eres open, this lickering sens-in will persisted. The blue light, which is visible only in the dark, appeared to

How to Act in Case of Fire. (Concluded from page 441) dredging the part thickly with flour—if the skin is not broken—and not disturb-

ing it for some time.
Any vegetable oil—such as mind Any vegetable oil—such as main, greet, or linesed—may be used with ad-rantage, a rag being soaked with it and ped to cover the wound. A very good spillontion is made by mixing equal series of tinesed oil and time water, form-

gerts of linseed oil and lime water, form-ting "carron oil."

Finally, it cannot be too strongly im-gressed that all clothing covering a burn hust be removed with the utmost care. Never try to withdraw the injured limb, but cut the clothing away-in small pleces, if necessary-so that the injured surface may not be more damaged Never hold a hurn in front of the fire, secording to the popular practice, this only increases the injury Have your oil or other application ready for immediate use as soon as the ciothing has been

Fontracile's Theory of Cometa, The idea of comparing contest to great giass lenses, which concentrate the suns glass lenses, which concontrate the sum a rays into luminous course which appear as the cometa tails, is so natural that its origin cannot be traced it was indi-lated by the philosopher Samea, about the commentement of the Christian era-but it has been abandoned in accordance with the example of Krpler, who after first ambracing this doctrine with after first ambracing this doctrine with enthusiasm, renounced it on discovering that a large comet, which he had occa-sion to observe, possessed a curved tall. The impossibility of explaining this phenomenon, at a time when it was not known that light consumes a measurable lime in traversing interplanetary space caused Kepler to abandon the idea. The celebrated Fontenelle, regardless of this chemical region of stitutions that fock received in the collection, took up and expounded in the objection, took up and expounded in the collection, took up and expounded in the collection of the arguments which may be throught forward in its favor At present, and the coast of every civilized country, phenomena similar to those to which Fontenelle attributed the forms into of the talls of counts, are produced by the lanterns of lighthoness. The dust which is supposed in the attrougher in which is supposed in the attrougher in the coast of every civilized country, phenomena similar to those to which Fontenelle attributed the forms that of the tall and country are produced by the lanterns of lighthoness. The dust by the lanterns of lighthouses. The dissi-which is suspended in the atmosphere is illuminated by the beam of light as fontenells supposed the cosmical dust to be illuminated by the concentrated beam of sunlight behind the lenticular cornet. De Fourviells shows that this theory explains the individual peculiarities of comets, and is confirmed by observations made recently at the Paris and Greenwich observatories. For example, a di ing that the cloud of cosmical dust is not continuous, but intermittent, and the occasional audden appearance of bright fecting body of considerable size, In a word, all the variations which are ob-served in meteoric showers might on this served in meteoric snowers might on the theory be expected to occur in the tails of comets. The evidence of the spectro-scope and the freaks of Morehouse's and Hailey's comets are against this lenticular

Engineers of the United States Go Engineers of the United States Geo-logical Survey estimate the annual dam-ses by floods in the United States at 156,000,000. If it too carry, perhaps, to statestake to prevent for the diminish this thinesase host, but far very magnitude in-yles, and the prosper ghistorium of Franke-jien, and the prosper ghistorium of Franke-jien, and the prosper ghistorium of Franke-gier in the control of the control of the con-pany lead to practical work that will serve if the highest theory of Manyerium.



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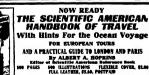
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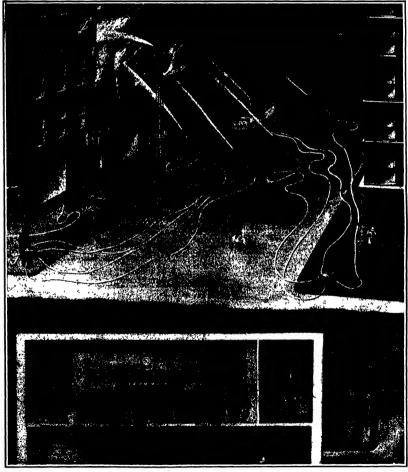


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NEW YORK BATURDAY, JUNE 11h, 1940 The Milion is always at a few reverse for examination illustrated activities and parties of that by interest. If the theolographs are always to describe about and the facts authority the contributions will recture year all girls along a Accepted articles will be possible or as regular space mare

WHAT WILL THE BAISING OF THE "MAINE" DISCLOSE 1

il E action of Congress in passing a hill mak ink action of Congress in passing a hill max-ing a preliminary appropriation for the work of roising the week of the Maine" is, for several reasons highly commendable. Chief among these is the opportunity which will be afforded to give descut burial in the national cemetery at Arito the bodies of the unfortunate men, who wer carried down in the wreck of the ship, and have re a sined entombed for the past twelve years. Look at it whatever way we will the fact that no effort has it whatever way we will the fact link in offort has been made to recover these bodies carries with it a serialn unconfortable aspect of neglect, and the ma-liun owes it to the memory of the dead, to the sensi-hilities of their surviving relatives, and lastly to its own dignity and self respect, to recover what may b give them desent interment with proper military

Second only in importance to the above considers Second only in importance to the above considers thous are those which affect the scalabilities, and particularly the sense of honor, of a European power with whom we are at present and hope ever to be, on terms of friendly understanding for it is a fact that terms of friendly understanding for it is a fact that the Spanish government fit two yeardy the implication that the destruction of the "Matine" was brought into that the destruction of the "Matine" was brought though not expressed, at it necessity followed from the finding of our Naval leared of Inquiry, which conclude that the Matine was descriped not from within, but from without in the opinion of the Court, again the report, 'this effect could have been produced only by the XIJOsloin of a nife situated under the control of the All of the situation of the court of the the port side of the ship

on the port side of the snip Non, although our Navy Department did not then and does not now, believe that the Spanish officials were in any way concerned in the disaster, attributing the explosion to the haired of fanatics it is doubt ful if this opinion was shared, or is even yet held, by the majority of people in the inlied States Therefore the raising of the "Maine will be well worth alt the trouble and cost it will entail, if the thorough physical examination of the wreck which can then be made, brings to light clear evidence that the explosion was due to internal causes, that is to say, in the spontaneous and therefore accidental comsay, to the apontaneous and therefore accidental com-hustion of the explosive contained in the forward magnetines. This latter was the explanation offered by the Spanish Naval Board which examined the wrek in the line of the disaster, and it is significant that it received eredence not only among naval experts abrond, and especially those of England, whose atti-tude was confedly friendly at the time but size nail percentage of the officers

ON II DELY uld be a "cousummation descutly to wished if the raising of the wreck should afford am ple evidence or even a strong presumption, that the 'Maine' was wrecked by apontaneous explosion in the magazines. Such a conclusion would cast no discredit whatever upon the officers and men who had charge of the "Maine" on that fatal night, for it is well under-stood and tas been proved by accidents such as that which occurred on the French battleshin "Jens that under the conditions in which powder was stored at that period and for some years later it was possible for spontaneous combustion to have taken place in spite of that strict observance of regulations, which nce before the Board showed to have been followed on the "Maine

Now, if this occurred, the tearing asunder of the steetive deck and the blowing out of the sides of

the vessel, accompanied by the instant flood portion of the ship forward of the explosion, would have caused the weight of the ram bow, the amohors and anchor chains, to bend the forward portion downward until the ram was hanging vertically below the ward until the rains was nanging vertically below the ship, held thereto only by the floor and keel plates. Then, as the main portion of the ship filled and sank, the bottom of the ship would naturally be folded down vertically against lited; leaving the keel and the don blo bottom in that peculiar, inverted V position, which

blo bottom is that peruliar, inverted V position, which gives it the appearance of haring been blown up by some powerful force arting from below. When the cofferdam has been built-entirely around the wreck and the water pumped out, it will be possible, in all probability, by a careful examination of the wrecked structure, to determine how far this theory is correct. If it he proved three will be eause for an evaluation of the work of the control of the proved three will be eause for an evaluation. ferred to the category of unpreventable arcidents, a proud nation with whom we are in friendly relation-ship will be vindicated from a charge which even tois a source of resentment that is none the less real because it is mexpressed

REVIVAL OF THE ROTARY ENGINE.

N the introductory article of a series desling with the rotary engine which was published in the year 1897 in the Sevience tvol zilli, Nos 1109, 1110 11iti, we said "The constant failure that has attended the efforts to produce a successful tolary engine, and the fact that the direct acting tolary engine, and the fact that the direct acting rank and rod, re-iprocating engine has retained full possession of the field, have led many people to sup-pose that the rotary engine inventor is as 41sionary a dreamer as the would be inventor of perpetual mo-tion. As a matter of fact, however, many of the ob-jects aimed at in the first dovice are as legitimate pers aimed at these of the latter are absurd and im-and useful as those of the latter are absurd and im-possible. Wille the supposed advantages of a rotary engine as outlined below, have proved very attract tive to the inventor, the results of careful compara tive to the inventor, the results of tarviji compara-tive tests have shown that except in the case of ro-iary impact engines or steam turbines, the rotary on gine does not compare in efficiency with the ordinary reciprocating type. Now it would certainly seem that with nuch theoretical and practical mechaniseem that with nucl theoretical and practical insertant-cal featured in its favor, the rotary engine would prove a formidable rival to the standard type. But this it has mover done, and for the very practical rea-son that owing to its peculiarities of construction, it is difficult to secure an economical regulation of the steam supply, and it is impossible to keep the joints steam tight and prevent Irregular wear of the parts The wear of the piston is always greatest at the dramference of the crimder, decreasing toward the cen ter, and this structural defect has thus far haffled the efforts of the mechanic. The packing decites that bear against-the circumference of the cylinder, like the idaion has of a vertical direct sting engine ingenuity has yet succeeded in compensating the variable wear of the side packing. There is a further difficulty in the fact that in rotary engines that have only one admission port the steam pressure pr a rapid side wear on the shaft, and renders it diffi a rapic side wear on the shant, and renders it dim cult to keep the sluming hox steam tight. Another dim culty is experienced with the value gear, which in the great majority of rotary engines is of the reciprogreat majority of rotary engines is or no recupro-caling type Reciprocations which would involve no serious wear at a moderate speed become serious at the enormous speed of the rotary engine, and produce rapid wear of the paris."

raids wear or the parts
Such was the situation in the rotary engine field
about a dozen years ago. The difficulties were of a
purel; mechanical kind, for the theoretical advantages of the type were highly attractive and never disiages of the type were highly attractive and never dis-puted we remember asking the late George M Hop-kins, a mechanical engineer of exceptional construct-tive ability, who had devoted a large amount of effort to the problem what he thought were the prospects to the property what he thought were the prospects for the production of a successful motor of this type lie expressed the opinion that the large ateam leakness, due to the impossibility of making successful frictional joints coupled with the heav frictional losses, to say nothing of the rapid wearing out of the

the state of the s

shop duty, say in, and day out, by a primary mouth, without shydring may span of and Returnage to make here to the secondary of the superior special property of the superior of an Humann tantitud, with the third that the superior of an Humann at the controlled the respectation, on a tudy of the drawnings description, that access has been achieved by an ing those very conditions of a mechanical may which the experimental work of the past hundy years had shown to be essential to a vetary cash. The tests at the terms in the superior test of the superior test of the same than the superior test of the superior test of the same than the superior test of the same t years has show to be essential in a rotary day.

The tests at Sevena Institute and at the contract plant speak for themselves. It remains for the for the to delermine how far the rotary will succeed in new Seld of high-pressure, superheated steam, which, theoretically, it would seem to be admiradapted.

Tout 2.

THE COVERNMENT AND THE INVESTOR.

HE Committee on Patenta has under consider tion a hill introduced by Mr Currier, purpose of which is to enlarge the juri tion of the Court of Claims so that the Co may entertain suits against the United States for the infringement or unauthorised use of a patented in-tion in certain cases, and award reasonable compet tion to the patentee

sure is necessary, when it is consi The measure is necessary, when it is considered that under the English common law, which prevails in this country as well as in England, a sovereign power cannot be sued without its own consont. The Unitsel States has established a regular tribunal, and charged

States has cetablished a regular tribunal, and charged in with the duty of adjusting claims against the generament but the scope of its duties does not include the adjudication of an inventor's rights when his invention has been appropriated by his government. When the government issues a painni, it does not grant a fevor to the inventor, but it "secure him a right," in the anagemy of the Court in U.S. v. Paimer (123 U.S. 271), and this securing of a right by no penaltic implication certries with it the opposite however the control of the c possinis implication carries with it has opposite power of destroying the right in whole or in part by appropriating it to the purposes of government without complying with that other condition of the Constitution, the making of "just compensation"

For all that many inventors have spent years of

For all that many inventors have spent years of their lives and purcleally bankrupted themselves in developing inventions primarily of use to the govern-ment only to find in the end that their property has been practically confiscated that they have no legal use not preferred, and that the governmental depart meets will not recognize the decisions of the courts to doubt the government has the right to appropri ale an invention necessary for the preservation of the militarial defense, yet appropriate has been based.

it would seem that some compensation should be paid Despite the decisions of the Supreme Court, despite the fifth amendment to the Constitution, which provides that no private property shall be taken for public use without compensation the government again lle use without compensation the government again and sgain sairse private property, in the form of patent rights, without compensation. The Court of Claims now has no jurisdiction to award compensation for the governmental use of a patent, except when such use is under a contract. To extend the jurisdic-tion of the Court so that it may entertain suits and award compensation to the owners of patents in cases where the use of the invention by the United States government is unanthorised, is the purpose of Mr Currier's bill

A similar measure was introduced by Congr A similar measure was introduced by Congressman Daisell in the closing days of the last Congress. The measure passed both the House and the Benate but it was not signed by the President. Mr Currier's hill is practically the same as Mr Dalzelfa with the exception that certain patents taken out by government officers or employees, which are good against all the world, are not good against the government. This is worto, are not good against toe government. This is an it should be; for whon a government Gloer is as-signed to the task of devising an implement, and the government bears the expense incidental to the inven-tion, and the officer continues to draw his salary in the meantime, it is evident that the government is the implied owner or at least licensee of the invention.

The experimental resistances fate the effect of elective property of the prope The experimental researches into the effect of ele

PHOINTERING.

- In is claimed by the contractors that a new record for Arberican shaft sinking has been accomplished on the Moodna siphon of the New York city Catalilli aqueditot, where a shaft 16 feet 5 inches in diameter was sunk 177 feet in thirty-one days. The work was done in hard Hudson River shale
- In a recent government test over the measured mile course off Rockland, the new battleship "Michi-gan" covered the fastest mile out of twenty successive runs at a speed of 1954 knots, which exceeds by Smore than half a knot the fastest mile made at the builders' acceptance standardisation trial.

The first of three concrete barges which will be used the hydraulic operation at the Panama Canal was the hydraulic operation at the Panama Canal was rjeestly isunched. It draws when complete with redging pump, motor, and equipment, three feet nine liches Ons-quarter-inch No 12 wire mesh has been ined in the wall construction. This behavior of these larges will be watched with great interest

The Interstate Commerce Commission has recently guied that, hereafter, on several railways in the North-west, the upper berths in Pullman steeping cars are west, the upper berths in Fillman sleeping cars are to cost less than the lower berths The Commission states that, in the past eleven years, the Pullman com pany has doubled its capitalisation and dividends without the investment of any new capital

The latest report of work on the New York State barge canal shows that this great undertaking is being pushed through with dispatch. At the present , 322.6 miles of the total work is under co additional plans have been completed for 482 miles, and the plans for another 264 miles are ovar seventyave per cent completed, leaving 64 miles, the plans of h are in progress.

With a view to determining whether or not the n type of shells will be deflected when striking at an angla, or whether they will bite into the plate, several of the new soft nosed naval shells were fired from a of the new soft nosed naval shells were fired from a 11-linch gun at the old ram "Kataddin," which was strickan from the navy list, and consigned to the scrap heap in July of last year. The hull was pro-tected by the latest 12-inch armor plate, in sections arranged on the vessel at various angles

An eyabar mada by the American Vanadium Co pany was recently tested to destruction by the American Bridge Company The test bars, which were of vanadium nickel steel, measured 14 inches by 2 inches by 35 feet. The results showed an elastic limit of 80,840 pounds, and a tensile strength of 99,890 pounds per square inch, with an elongation of 335 per cent in 13 inches, and a reduction in area at fracture of 533 per cent Part of the bar was bent cold under a 14,000-ton press, and flattened upon itself without sign of fracture fibouid tha matter of price not provs an acis, this will be an ideal material for th of long-span bridges.

Efficiency tests are conducted by officials of the Pennsylvania Railroad, who, at unusual times and places, sot signals of caution or danger, display fusees, does on the track, with ce torpe all employees constantly on the alert for signals. During the tests for 1909, the following records were made by the men Block signal rules, 47,384, of which 89 6 per cent showed perfect observance on the part of the employees, 45.887 tests of rules governing flag men, use of fusees, torpedoes, and other signals, 99 6 per cent perfect. Altogether, some 300,000 efficiency ed a practically perfect record for the employees.

Acting in accordance with the Spooner act of June 28th, 1905, which states that "the President shall cause to be constructed such agis and commodious harbors at the termini of the Pausma Canal, and make such provisions for their defense, as may be necessary for the agisty and protection of said canals and harbors," ident Taft has saked for an appropriation of \$4, President Taft has saked for an appropriation or vi-00,000 for the commencement of autitable fortifica-tions. He indorses the report of a special board of edicers of the army and nery, which provides, we un-derstand, for an adequate defines by batteries mount-ing the new 14-inch gum The total cost of the com-pleted fortifications will be about \$15,000,000

A most commendable movement in the auth region of northeastern Pennsylvania is the introduc-tion of mine schools. In former days, the Singilab-speaking and Teutonic races, skilled in mining, presmaling and Toutomir mose, actived in mining, pre-dominated in that district, but both ye work is done by a class of Barropeans whose traditions and exper-sion's have notifient to do with mines. Several of the signing companies have established subsole for the headed of these simplycrose, now of the first of which was 'plast separationed by the Philadelphia & Beauting One and Irok Ochmeny. Mers, in attendance, are signed the september and formanyment employed in the object of the best without. The course, which designs a sublimation page to the process which designs a sublimation page to the process which the contraction of the second page to the contraction of the contraction of the second page to the contraction of the contraction of the second page to the contraction of the second page to the se

Scientific American ELECTRICITY.

done more for the betterment of the race than all the art, all the civilising efforts, all the so-called literature of past ages, for which some respectable people went us to have such an exaggerated reverence"

The thirty-third convention of the National Electric light Association, which met at St. Louis last week, reported a vary prosperous year, in which 5,200 mem bers were added, bringing the total membership up to 5,270 The association began in 1885, with a membership of only 71 There are 820 operating companie represented in the association, and these or per cent of the capitalisation of the electric light indus try in this country

A new form of mercury-rod interrupter has been developed, with the object of producing a sharper break. It consists in covering the mercury with a quanching liquid As the rod is withdrawn from the mercury, a hubble of vapor from the quenching liquid forms on the end of the rod and tends to press the mercury level anddenly downward at the break, thus effecting a more perfect current interruption, even though the rod may rise comparatively slowly from

The New York Legislature has passed the bill which places talegraph and telephons companies of the State places talegraph and telephone companies of the State under the supervision of the Public Service Commis-sion for the second district. The bill empowers the Commission to investigate and regulate the rates and service. The companies are required to fits annual reports, and the Commission may vote any priva-gunder the franchises of the companies which have not as yet been exercised. Reduced rates, passes, or franks for the transmission of messages are problibited

A novel ventliating system has recently been de veloped, which consists of a small electric fan con veloped, which constain of a small ciertic fan con-nected to the window still as seed manner that it may be operated either to draw in air from the outside or to exhaust the sit from a room. It is suggested that the value of this will be appreciated in a kitchen on ironing day, or when any baking is being done, as it prevents the heat from spreading through the entire house, busides making the kitchen itself more com-

In order to determine the heat generated by concrete when hardening, aix thermometers of special con crete whan narcening, aix incrementars of special con struction are to be imbedded in the concrete walls of tha Gatun locks of tha Panama Canal Bach thermom-eter consists of an iron cup in which is a resistance coil This is connected by a pair of lead-sheated copper wires to an indicating instrument and a smell storage battery Variations in the temperature of the coil produce variations in the electrical resistance, and this is indicated on the instrument, which is estimated to show degrees of temperature. The instrument ps a continuous record, which should prove of con-trable scientific interest and importance.

It is a difficult matter to measure very high ten sions of electrostatic or Wimshurst machines, owing to the glow discharge which is apt to occur shove 40,000 volts. A new method has been adopted by Prof. C F Guya and Mr A. Tscherniavski, which was re-centry submitted to the French Academy of Sciences This consists in inclosing the spark gap and the ele eter in a substantial box, in which compre trometer in a substantial box, in which compressed gas is introduced According to the Panchen law, the disruptive potential is approximately proportional to the gas pressure. Thus, with a given potential differ-ence, the electrodes of the spark gap can be approached to each other in proportion to the increase of gas pressure, and by this shorter gap the electrostatic effects are reinforced, insuring more accurate readings. his method has been amployed in measuring the ten-ou of a Wimshurst machine, which showed a voitage of 80,000 with a proteing box.

Last November there was a series of heavy snow orms in Germany, which did considerable damage to acoran in Germany, which disconsissensis samage to overshead telephona and teleprophilates As result, a careful investigation was made of the question of putting such lines underground, and it was found that by neing the Pupila system, underground cables could be used to good advantage on lines of iess than 600 miles in length, with wires not more than three millimeters (0 118 inch) in diameter. The advantage millimeters (0.18 inch) in drameter. The auvantages of the underground extern were found to be as follows: That there would be no interruptions due to external causes, that there would be no danger of cross talk, that the efficiency of the line would always be constant, that there would be no interruptions or exconstant, test there would be no interruptions or st peace for resider, due to external censes, and that white juring the cables extra wires could be provided, which would permit of further expansion to most fri-ings denance. It was also shown that telegraph and displaces large could be half in the same cables with-spit diamon, at the could be and the same cables with-spit diamon, at the could be and the same cables with-

SCIENCE

Mr. Charles E. Peck, botanist of the State of New York, in his annual report states that the known species of edible mushrooms in New York amounts to 200 Five new kinds of edible mushrooms were discovered in the leat year

Dr. Charles Forbes, of the Department of Physics in Coinmbla University, has installed in Barnard Coi-lege the first permanent apparatus for the installation of the Foucault experiment, to show the motion of the earth Dr Forbes set up a temporary apparatus for the experiment in St. Paul's Chapel of Columbia Unity some two years ago, which was describe these columns

these communs

Dr William Phipps Blaks, a member of the first
class over graduated from the Shofflad Selentific
School of Yale, side freenity at Berkeley, Calibrai,
shortly after he had received the degree of Li.D from
the University of Culifornia. Prof Blake was
years old. When he graduated from Yale in 1852, he
came the gandegate and miseralization for the University of the Color of the Col tivities included the editing of the Mining Magazine, geological work for the Japanese government, the ploration of a section of Alaska, the teaching of min alogy and geology in the College of California, a ge-logical examination of Santo Domingo, and the teac ing of goology in the liniversity of Artsons

The satisfactory examination of the absorption spectra of glass of various sorts requires, in addition to oplie, a spectrometer with glass or quarts the there s and prisms, and the exact determination of the length of the limit of transparency requires the use of a silt with vary sharp edges a camera with an excellent lens, and a source of light the spectrum of which contains many sharply-defined lines and ex-tends far into the uitra violet. The spectra hitheric employed for this purpose including the spark spec-trum of an alloy of cadmium, zinc, and lead, the spectrum of mercury, obtained by means of the vacu tube or the electric arc, the spectrum of the carbon arc and even that of the Heraeus amsigam lamp (mercury, lead hismuth, sinc, and cadmium), co tain too few lines to give satisfactory results. Zick andrabt has recently employed the arc spectrum of iron, which, because of its extraordinarily large numiron, w ber of times of accurately known wave length, appears well adapted for the study of absorption glass A Zelas spectrometer with quartz ienses and prisms was used. The results, which are published in tabular form, are too complex to be briefly described.

Prof. Haber claims to have solved the problem of troit. Ander taking to have solved the protein of the direct synthesis of ammonia from its elements nitrogen and hydrogen. The process has been purchased by the well known German establishment, the Radische Anilin nnd Soda-Fabrik If the process is as practical and economical as its invontor claims, its as practical and economical as introduction will quickly cause a revolution in a com paratively new but aiready important branch of in dustry, the manufacture of artificial nitrates in sev eral countries possessed of abundant water power, large nitrate factories in which oxygen and nitrogen are combined directly by means of the electric arc, are in operation Prof Haber gives a few details con-cerning his process, but states that the combination cerning his process, our states that the community of hydrogen and nitrogen is effected at a temperature of about 1,000 deg F and a pressure of 200 atmospheres. In a recent lecture he exhibited an experimental apparatus which produced three ounces of pheres. in a recent lecture he exhibited an experi-mental apparatua which produced three ounces of liquid ammonia per hour. The presence of a cata-tyrer is required to accelerate the combination. For this purpose, Prof. Haber employs aranium, but the rarity of this element appears incompatible with its mployment on a commercial scale

employment on a commercial scale.

The adulteration of food in France is said to result in a profit of one hundred million dollars per year.

Bread, which may be called the national food of Frence, he long been adulterated largely with tate, a aubstance which is not only indigestible, but is ex-ceedingly irritating to the gastro-intestinal mucous membrane because of the sharp crystal fragments which it contains. Flour is often mixed with ainm which it contains. Flour is often mixed with amount of water absorbed, with sinc subphate to keep the bread fresh with copper sulphates and ammonium carbonate, to dismissian the quantity of yeast required and temperors has appearance of bread made with spoiled four Denatured sicohol, costing one-sight the price of pure alrohol, to used for the manufacture of the liquours and operation, which are no largely consumed in France Aichold, destarted by the deliction of methyl mixed, mixed with property of the deliction of methyl mixed, mixed with part to the sum and and rain, which have the effect of preclicitation to nme or water and apposed for a two days to the sui-air and rain, which have the effect of precipitating the methyl alcohol so completely that its flavor remains hearly perceptible. The militure is then brought to the desired alcohollo strength by the addition of strong spirits, flavored to suit the tests of the consumer and sharpened by the addition of a pint of nitrie sold to

A COMMERCIAL ROTARY ENGIN

PRACTICAL SOLUTION OF AN AGE-LONG PROBLEM

Elsewhere in this haue we have discussed editorially the problem of the rotary engine and set down the mechanical difficulties which must be mastered before a successful engine of this type can be produced. Reference was made to the fact that a recent rotary engine has undergone a successful laboratory test at the Stevens Institute and a successful commercial test of six months' duration at the plant of a leading test of six months duration at the plant of a leading contractor in this city. This engine, which was de-signed and built by Mr. Gerardus P. Herrick, of 74 Broadway, this tity, forms the subject of the accom-panying illustrations. The principal distinguishing pauring insurations. The principal distinguishing features—those which contribute more than any oth-ers to its success—are, first, the fact that reciprocaling movements are entirely eliminated, all of the movements being rotary and secondly, that the main shaft of the engine runs upon a film of steam, whereby the destructive thrust, transverse to the axis, is completely counterbalanced

MERIANNAL PRATURES rotors or druns of equal diameter, placed one above the other, and running with the barest clearance be-tween their peripheries. By means of external gears, they are caused to rotate in opposite directions at the same speed. The upper drum rotates within a closed cylindrical casing, between the walls of which and itself there is a bare micrometer clearance. The lower, or what we might call the power drum, rotates within a casing of integer dismeter than itself, and it is provided with a rectangular piston which fills the annular space between the external periphery of the dram and the internal periphery of the casing. This drum and its attached piston also rotate within their casing with only a micrometer clearance between the adia with only a micrometer clearance between the adja-cont surfaces. The peripheries of its upper and low-casings intersect each other sufficiently to allow the upper drum to project within the lower casing until it rotates with only the alightest clearance between itself and the power drum

VALVE MECHANISM —Sunk in the upper drum is a transverse, semicircular recess, which serves at once as a pocket to admit the piston of the lower drum as the two drums roll together, and also as an admission valve for the live steam, the proper registering of th valve for the Mvs steam, the proper registering of the piece with this pocket being assured by the fact that the two drums are seawed togethar fitten in admit-table to the steam are simple and easy to under-ther. The attention of the steam are simple and easy to under-stand. As the piston (which, viewed from the side of the engine shown in our drawing, moves opposite to the hands of the clock) clears this pocket in the to the names of the clock) clears the pocket in the upper drum the latter moves forward until its leading edge close closes the steam iniet, when live steam is admitted to the annular space back of the piston and continues to flow therein until the

after edge of the pockat has swung round clear of the steam cylinder This point of cut-off is the popoint of cut-off is the po-sition chosen for the ac-companying illustration. During the rest of the stroke, the steam works expansively, until the after expansively, until the after face of the piston clears the forward edge of the exhaust ports, which are shown in dotted lines at the end of the circu path swept through by the

STAND COUNTERBALANCE The most original and valuable feature of this en valuable reactive of this settled into its the ingenious meth-od by which the heavy load on the main shaft, due to the radial steam pressure in the cylinder, is exactly counterbalanced b) a steam pressure acting in the opposite direction. the roter being balanced accomplished by means of what are known as bai-

ancing piugs, which are inserted in steam balancing chambers. There are two of these plugs, one on each chambers. There are two of these plugs, one on each side of the engine. They are made of sufficient length and diameter to provide an area which, at any part of the strong the search sequal to the area of the sur-face of the drum which is under the presents of the the stemm. For a little over half their peripher, and on the side immediately opposed to that portion of the annular cylinder space upon which the heaviest steam pressure is developed, the belance plugs are provided with a series of recessed steam postests, and steam is admitted to these pockets successively by a series of holes drilled through the drum. Consequent



The piston is shown at out-off. Note small boles back of Rotary engine with side plates removed



By this device the rotor rides on a film of ster is taken off the main bearings The balancing plus.

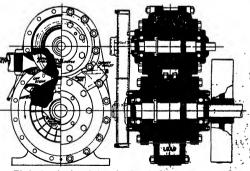
JG PROBLETT

pournals prevented, but it is possible to thouse the correct on finally addinged half-bearings, whose they is, simply to heave the very less thank to be the correct on the correct on the correct on the correct of the c hrake horse-power en a steam consumption of a pounds per brake herse-power per hour; which peres favorably with the steam consumption e average reciprocating eagine of similar ospecit; will be realised that by getting rid of pucking de and introducing a system of steam balancing and introducing a system or search searcing, are, Harrick has not only prolonged the life of the rotary-sagine, but he has greatly increased its autjust by gui-ting rid of that accumulated friction which, in earlier forms of the rotary, was sufficient to cut down they economy to a point which rendered them comman-cially unserviceable

cally numerricable
Lincontrow Therm—In his report of the laboratory
tests at Stevans Institute, Prof Pryor states that he
obtained the following results With a steam per
sure of 145 pounds and 1,000 revolutions per minute,
of 86 brake borne-power was obtained with satisfact
stans, on a consumption of 50 7 pounds of water per
of 185 pounds of 50 7 pounds of water per
of 185 pounds of 50 8 pounds of 185 pounds
at 1,001 revolutions per minute dawnoped 80 40 brake
borne-power on a communition of 454 pounds of 164 pound an account recontinues per minuta developed 80 46 hrake horse-power on a communition of 44 pounds of water per hour in commenting upon these tests. Prof Pryor says of the engine "lis standiness of operation, its lack of vibration, and its output per cubic root of space occupied, should be particularly communied"

mended". COMMERCIAL TENT—To test its commercial value over a long period of time, the engine was coupled to a dynamo at the Depone Contracting Company's plant in this city, and from August 14th to December 21st., 1909, it served to produce the current for lighting the plant day and hight. It was run for 1,858 hours, or the equivalent of more than six full working months. At the and of this time, it was again tested at the Stevens institute; when, under similar conditions of revolution and steam pressure to those which obtained at the first test, the steam consumption was found to at the first test, one steam consumption was raung to be \$28 pounds, the slight increase being attributed by Prof Pryor to the fact that new ball bearings had been put in without sufficiently careful adjustment, and some rubbing of adjacent surfaces had occurred

FUTURE FIELD OF THE ROTARY —Apart from the field of usefulness open for the rotary because of its compactness, sim-piloity, perfect balance, and moderate steam conwider and more important wider and more important field presented in connec-tion with the steam tar-bins. We have frequestly in this journal drawn at-testion to the fact that the mean turbine is meat efficient in the lower risages of the expansion of clies steam; and this in the higher rannes, bearms of



This view shows the valve we Irrogular section

A PRACTICAL COMMUNICIAL BOTARY RECTUR.

iy, the thrust of the steam toward the shalt of the rotor is, for all positions, constantly believed by an equal thrust of the steam, every from the field. Per-fect believe is secured, the roter precisionly remains upon a fine fine of tire down. The polyhadapor of the imparious arrangement are that, for the polyhadapor frottom and description, queried 'while of the con-

pressure and superheit, and take to

THE COSTLIEST EAR OF CORN IN THE WORLD

BY FRANK C. PERKINS

then we present ton champion ears of corn, which were half at the rate of firsti per bushel,



corn might not be least not so profit-able as other vari eties. Farther more, the price at which ears of corn are hold may be a fictitious or a forced one A farmer may take a prize at a fair When the corn is put up at auction, the farmer, having amount as pre-mium for the champion cern, can afford to hid it

GIANT RUHMKORFF COIL

BY JACQUES BOYER

The first induction coil was made by Meason and Referred in 1845, but it was not until 1881 that Rubin the West and the first part in the inductional to definite form, which has not sensibly varied since that time, although it has been improved and modified for various applications. Rchimkord increased the number of turns of wire of the soundary circuit, for which he employed a very fine and very long wire. Perfect insulation was obtained by as at ur a ting the order of the magnetic force a was in creased by inserting a core of parallel from wires inside the consentric coils.

These wires are magnetised by the primary ournetic fux produces currents in

ouf.
The principal improvement in the principal improvement in which have been saide in Rehmberff's original are the following. In the city, increased the person of the heaving in the case of the person of the pe

er This method avoids the production, between two adjacent turns of wire, of a difference of potential sufficiently great to pierce the intervening insula-

tion.
The interrupter, by which the primary circuit is broken at very short faturals, was improved by Ducre-tet, by giving it the form of a vibrating strip of metal, fixed at both ends and bearing at its middle point a

induction cells are usually provided with Poscruit's mercury interrupter, operated by a separate battery of one or two cells.

One of the largest induction cells ever made was constructed long age in England for Spottiswoods, by the instrument maker Apps. Its length was 88 inches, its acturan allmenter, 185, inches, its total weight, 1,4715 pounds, and the weight of its cross of soft from 67 pounds.

consisted of 3,100 feet of wire of a diameter of 1/10 luch. The length of the secondary circuit was 280 circuit was 250 miles. It consist ad of 341850 turns of wire. This apparatus, operated hy 30 Grove cells, produced a spark 40 inches long. A still larger coll was recently constructed in Paris by Carpen

Paris by Carpen tier The second ary circuit of this instrument is composed of 97% wire of a diam eter of 1/125 inch The soft iron core has a length of 80 inches and a sectional area of 9.2 square inches The primary coil contains 792 turns of copper ribbon, about 14 inch broad and 1/25 inch thick arranged in six layers. The coli te engrounded by



A STAFF RUBERGRYP COST.

place of sort from the principle of metal. In this way and the principle of th

an change the more than 1/2 inch thick. This giant induction coll, operated by a current of 110 voits and 30 amperes, produces a spark about 50 inches in length.

The Canadian Government have appropriated \$50,000 for experiments in electrical amelting, which are to be conducted under the supervision of Dr. Sugme Hannel, superintendent of mines for the Government of Others.

Scientific American

FIRE FLORETING WITHOUT FIRE ENGINES.

The practical elimination of the fire angine from fi fighting in the husiness section of lower Manhattan has been brought about by the successful use of the has been brought about by the successful use of the high pressure independent fire service Good results have attended sho this modern magind in Brootlyn, Concy island and Philadelphia, and in all of these piaces independent systems of high-pressure mains supplied from central pumping sations now are sential and established elements in much needed fire The frontispiece of this week's Science MICAN Illustrates the method as by the firemen, and while it is not intended to repre at any particular plant, yet it shows the esset features of a modern high pressure number station otor-driven pumps and the use of the hydrante ong the distribution system, such as are employed in New York city

Now if a pressure of water at the hydrant can be maintained as great as that furnished by the pumps then the latter of course is sup cus. and that, along with adequate water supply, is what, in short, the high pressure system accomplishes.
This condition however, so ancressfully realized, has
been made possible only by modern mechanical and al engineering, to which the firemen have ac by intelligently studying and applying the new re-sources at their command Referring to our illustra-tion, it will be seen that the pumping station has two sets of intakes for its water supply—one for fresh water and tha other, which is in connection with a vacuum pump, for sail water in the case of the New york system, the Croton water is used under all nor-mal conditions, and the mains are kept filled at the ordinary city pressure. The drafts on the city's supply for fire purposes compared with the usual daily consumption are inconsequential, but the river or consumption are management at any time through intakes extanding direct to the pier slips, and is available in case of any failure in the frosh water supply or at a time of a large configuration. For high pressure stations either gas or electric motors are available to stations either gas or electric motors are available to drive the pumps, as there is slways a supply of this kind of power from public service corporations dis-tributed underground, and carefully protocled and du plicated in such a way as to make any possible failure highly improbable Thus in the Manhattan pumping stations the high-efficiency centrifugal pumps are driven by induction motors using alternating current ariven by induction motors using atternating current from the Edison Electric Company, with direct con-nection with its Wateralde station and duplicate con-bection with its sub-stations, provision even being made to connect with Brooklyn in case of emergency A contract between the city and the company requires a constant reservation of power, and the simple of tion of switches puts the machinery into full of tion The centrifugal pump has been found most ad vantageous, particularly with electric motors.

A high pressure system protects a given district here the mains and hydrants have been installed and in the case of New York this territory extends from Chambers to Twenty-third streets, and lies between the Hudson River and the Bowery and Third tween the Hudson River and the Bowery and Third Avenne. The pumping stations are located outside of districts likely to be affected by any possible config-gration, and free from danger from neighboring hulid-ings. They are situated at South and Oliver streets and ings. They are situated at 50 uth and Oliver streets and at Gameroro and West streets. The hydrauts in this system are of the type shown in tha illustration, and are spaced along the mattee at an average interval of 70 feet, and to reach a building on fire in no case would there be required & inentity of hose greater than 450 feet, an important depositeration, as the pressure in a time of hose diminishing supplied to this content

Let us essume that a fire-breaks out in this protected (erritory, and the siarm is transmitted in the usual way, either from a street box of an automatic fire-alarm telegraph to fire headquasters. Thence it is sent out over the fire-alarm circuit of the various fire bouses over the fire-starm circumfagfit the various fire bound in the city including the two high-pressure stations. At these stations night and day there is always an operator on duty who size at, a ladephone switchboard by which the station can be pell in communication not only with the sense of fire but with headquarters and with the other station. Special taisphone in media borean are distributed in close precinity to the byboxes are distributed in close presumity to use ny-drants through the high-pressure district, and con-nect direct to the station, a special service being main-tained by the lelephone company. In front of the operator is a large board containing the numbers and locations of the various starm boxes through district, those to which his own station respo untries, those to which his own station responds the meditately being designated in red The starm comes in over the regular circuit the gong sounds the appro-priate number, which is also registered by perfora-gion on a tape, on which also is printed the time by guent on a same, on which same is printed the time by a clock. If the sizer is one for the station, the opera-tor immediately grasps the lever of the marine tele-graph, and the signals to start are sounded sub-love on the large indicator on the wall. The over spring immediately to their pinces, the whist engineer at the

switchboard and the otlers and machinists at th appointed fations. From the awitchboard everything can be controlled and regulated The current is switched to the motors, and the ponderous pumps are soon revoiring, another switch open electrically-controlled valves regulating the water anpply, while controlled value regulating the water anply, while recording and piles melter and indicators are before the cycle of the calef angular. Not every fire requires the field, of water that can be set in motion from the station, and the standing order is to start one pump, regulating the pressure at the outlet at 126 pounds. The next order must come from the chief of the fire; department at the fire, and may be a call over the telephone to increase both water supply and pressure or an order to shut down the pumps. As shown in the picture, the chief at the fire is even in closer or an order to shut down the pumps. As shows in the apicture, the chief at the fire is aren in doser touch will the pumping station than he could be considered to the could be seen as of activity. The scene within the station when the pumps are in operation is hardy one of extractionary activity. The scene within the station when the pumps are in operation is hardy one of extractionary activity, and no greater cartisates its small fosted than in a well-appointed power plant. The descript control of the chief is no complete that he does not need to learn his position at the switchboard, and with ear open for orders and eye on his meters and unfections, the estire situation is at his command of the chief is sufficient to the control of the chief is sufficient to the control of the chief is sufficient to the chief is sufficient to the chief is sufficient to the chief is sufficient to the chief is sufficient to the chief is sufficient to the procurse of the fire house, from which they followed the engines, to the front and are given they followed the engines, to the front and are given right of way over other apparatus in the streets. When the reliability of the high-pressure service was estabthe reliability of the high-pressure service was setal-ished, for much alarms the engines were not sent out, but held in resgree in the fire houses. In two houses too engines were natively removed and double sec-tion hose companies maintained. As the hose is heavy, the work of carrying and hauling it is par-ticularly ardsous, so that, in this respect, the labor of the firms at the fire has not been lightened by mechanical progress. The automobile hose wagon used by the New York Fire Department, however, has used by the New York Fire Department, however, has demonstrated its complete user/intense for transporting the heavy Sadde of 3 inch home much more rapidly than the transporting the heavy Sadde of 3 inch home much more rapidly than the transporting that the first the first the first the sadde of a fearth connected with tha hydrant outst, of which there are four, and excessate learnish are laid to the serees of action. The former engineer of tha fire engine with his lever key takes his position at the hydrant and witching the takes his position at the hydrant and watching the pressure gaze at the outlet, opens or shuts the valves as ordered. The line is stretched where the exigen-cies of the "a-usion demand, perhaps to the standpipe connections. Thick must be placed at the sidewalk connections, which must be placed at the sidewalk close to the shiding walks, and which connects with the standpipe itself within the building with its out-test and hose resion excel floor. It is this that, affords the fire protection to a skynersper, in addition to the pumping plant of the building, and must be used by the firement or the hither stories, or it may be used to deliver a stream to a fire it an adjoining building. The connection may be made to the sprinker syners or the stream of the halffing hrough as similar outlier to to.

escape, and three fastends or clamped with one of the devices which have been developed for this purpose. Now a single like from one of the purpose. Now a single like from one of the four outsile is practically an powerful as that derived frem a five entire, when it is resulted that these streams can be delivered with a force sufficient to tear off, correlated there, when it is resulted that these streams can be delivered with a force sufficient to tear off, correlated that the streams can be delivered with a force sufficient to tear off, correlated. The New York Fire Department's map of the bid-presenter system has been most successful, and gither on a par with the excellent engineering inserted, and content of the stream of the system on the State Side of the city the distribution mains will be half depict in additional streams on the surject work to be surjected as the stream of the system on the State Side of the city the distribution mains will be half depict in additional stream of the stream of the purples assistes half as the stream of the stream of the purples assistes half as the stream of the stream of the purples assistes half as the stream of the stream of the purples assistes half as the stream of the stream of the purples assistes half as the stream of th ing streets, passing out from the pumping station into two systems of mains, ordinarity operacted but capable of being toolated by the gate valves at the ab-tion and by detract electrically operated, valves, of some point of intermedica. With the Philadelphia spe-

cellar pipe to flood the basement, or, as shown in the

illustration, two lines may be siamesed into the water tower The permanent nextle holders of the hose

tower The permanent nozale holders of the hope wagons may be used, while for a single stream the tripod nozale holders are employed, as that, poperall presents reacher holding he hose aga directlys its practically impossible areas for two or three threeses. The hose may were have to be holsted up note a fire escape, and there featened or clamped with one of the devices which have been developed for this per-

tem, which incidentally uses gas motors and direct acting pumps, in use for a number of years, as which has recently been extended, and with a way which has recently been extenseed, and what is wonly planned project under way in San Francisco, it would seem that the day of the fire engine had peased and that the central fire protection method would some take its place in many other large cities.

Ivas & 1916

A High-Pressure Pire Reduction Valve. Soon after the succes aful inauguration of the high soon area the successful inauguration of the high-pressure fire service in New York city, the Sommerse Amenican's called attention to the need of a suitable regulating valve to be used at the hydrant, in order to render possible the control of the pressure on a eingle line of hose and its adaptation to the work, hand. The need of such a valve has become inciingly apparent

hand. The need of such a valve has become surry largy apparent.

For some purposes, as for a water-tower or stand-pipe of a shyscraper, the highest pressures may be demanded, while for other lines at the same be demanded, while for other lines at the same be developed as the control of the same and indicate the same for the same of the same

has been adopted for suppressive complements such arrivals with a small and compact designed to be transported on the hose tender with the smaller tools, there are two pressure gages, not on the linite dischowing the pressure as the hydrant furnished by the pumps, the other her reduced pressure as the water passes out of the valve into the line. After the hose has the interest with the late valve control to the hydrant with his key wreach, and then he gate valve to the outlet from which the line is taken. The handle of the regulating valve is served down, allowing no valve to passes. A half turn of the down, allowing no valve to passes. A half turn of the water at a pressure approximately of 11 pounds of the passes of the pressure and the pressure of the pressure and the pressure of the pressure and the pressure of the

or hydrant pressure. In short, the pressure on any time from such a varie is entirely under control, and the angineer merely has to watch his page and turn his handle until the desired point is reached when the pressure is maintained automatically in a recent text before the engineers of the New York Department of Water Supply, Gas, and Bilectrically witnessed by the author as the engreementative of the Sirvarray American at the Sir Edwards High Sirvarray Canadarant at the Sir Edwards High Sirvarray Canadarant in Brooklyn. It met every condition Pressure Station in Brooklyn, it met every condition imposed Different pressures from 76 to 300 pounds were put on the mains by the pumps in the adjacent station, and the pressure on the line was reduced as ordered by simply turning the handle of the vature Thus when over 240 pounds was recorded at the hy-Thus when over 240 pounds was recorded at the drant, 40 pounds was dailvered at the nossio 7 adjustment and maintenance of any desired preser were far more easily and satisfactorily controlled it would be possible with a steam fire engina Variation. seure on the mains did not affect sensibly

were an more sainly and assistance or controller may be a simple to the control of the control of the valve while when the line was and the present of the valve while when the line was shirt down at the nostin no effect was manifest.

The valve consists assentially of a valve body, containing a seal, main disk, plane, auxiliary valve; a claphragm, a compression faring, as adjusting sorwer, and claphragm, a compression faring, as adjusting sorwer, a handle, and a small, planed-ported by plane valve. The data and piston are genteroided of one piece, and the portion of the model flaments which the presence passes up over the flatton, which, being of greater diameter than the disk, driven the latter down to its seat, thus shutting off the presence. The next part of the operation is beingfully which the sign presence is endowed by the costing of the gaziliary valve mentiosed above, which being of greater diameter than halp optri through which the sign powerure is conveyed to the top of the presence and the sound as a considered of the control of the gaziliary valve mentioned the sign of the presence of the control of the gaziliary valve mentioned as the reduced presents have been commended as the control of the sautility valve to close, they was present the same as the presence as endowed in the reduced presents have been dealed, as of the presence of the meant large of the presence of the control of the meant large valve also specified to reposted as often as consider they resident with the control of the meant large valve also specified to repost of the meant large valve also specified to require the meant large valve also specified to require the meant large valve also specified to require the meant large valve also specified to require the meant large valve also specified to require the meant large valve also specified to require the meant large valve also specified to require the meant large valve also specified to require the meant large valve also specified to the meant large valve also specified to the speci

Marremontence.

A STREET, WETEOD OF CONSTRUCTION AN BILLIPSE

To the Editor of the Scientific Assurant: In your issues of July 16th and August 25th for the year 1906, two methods are suggested for drawing an ellipse with the aid of a compan. But the g an ellipse with the aid of a compass. But the mpass has power produced a true ellipse, and these milts are merely close approximations. Also, in the st-named issue, there is a method for constructing ellipse by means of a network of tangents. This an entipes of means or a network of tangents. This method also was proved inaccurate by Mr Warwick Worthington in the number for July Sist, 1808, and Is in turn offers a solution by a network of tangents which I believe given a perfect oilipse, although the matched is somewhat cumbersome for o.dinary use

I sensite given a perfect onlyse, according to d is somewhat cumbersome for ordinary use re is, however, a simple way of constructing an of any desired dimensions solely with the aid



A SUMPLE METROD OF CONSTRUCTING AN ELLIPSE

of straight-edge and pencil. No originality belongs to my method, but it is readily proved to accord with

to my method, but it is readily proved to accord win correct mathematical principles. On a straight-edge or ruler mark off a distance [F. oqual to half the desired major exits, also, from point F. a distance [F. oqual to half the desired major exits, also, from point F. a distance [F. oqual to half the desired major exits, we construct per Endering now to the drawing, we construct per that the points Q and M fall causely upon these per pendiculars. The point F will then fall somewhere on the curve of the proposed ellipse. By shifting the retare about in such a way that Q and M slawys far its and the period of the proposed ellipse. of the cervice of the proposed empse my senting and maria about, in such a way that Q and M always fall on lines AA' and BB', respectively, the mark on the rate at P will give the position of any number of points, which afterward may readily be joined by a continuous line Envano M Warra.

Washington and Jofferson College, Washington, Pa.

Astronomical Photography.

The plan of photographing the entire heavens origi-nated with Monokes in 1887. The death of this emi-nent man of science was one of the advorse factors which have compired to delay the work, which now, however, promises to draw to a triumphant conclu-

The importance of the universal photographic ittal chart to the astronomer of the future cannot be over-estimated. It is now generally acknowledged that the stars are in motion with respect to one another, and our entire soles extreme its motion through some, so that one day the constallations will be seen from a sentility different point of view Changes will see to pass in the apparent arrangement of the stars groups, and in the course of years they will comply, so that semething may ultimately be discovered of the universe it may be that the chart how being perpared will enable the autrenomes of some centurica hance to learn as much of the great universe of stars are we know of our comparatively minute soins a tensor providing within it. chart to the astronomer of the future cannot be over-

man remiring within to the contraction of site years to be the only method of revealing the structure of these scanning to the contraction of the scanning to the contraction of these scanning to formations, the schnine, at all adequately, the star chart on a large scale, though the more present to large because the scanning to the contraction, possesses can incalculable value of itself. The wonderfully accurate price of the contraction of the contraction of the contraction of the contraction of the contraction of the contraction of the contraction of an oscillation in the position of the acts of the surface of the contraction of the tography has be

Scientific American

chart over the elder method of observation is quite chart over the elder method of observation is quite simply explained. The image of a star in the tele-scope is very rarely absolutely steady, for the light, prior to its reaching the instrument, has to pass through the vertinable sea of our own atmosphere, con-stantly disturbed, in practically all portions, by cold Rifle shots are familiar the sert of effect which is thus produced. On a blass plot day, when currents of air are vising road has been been the based ground, the target seems to dance before the beated ground, the target seems to dance before the seven growing talker and shorter and breaking in pieces, with the bail's ays now in one corner and now altogether vanished Something of the same titing happens to the star image when the telescope is set up in any but a very few transgul places, and especially when it is in a country much broken up by monatule chains or arms of the see. On all but two monatule chains or arms of the see On all but two seen dancing and quivering in the telescope, more or less as the str is much disturbed or uniform day when the observer tries to set the spider line of his measuring apparatus upon the image, he has to make measuring apparatus upon the image, he has to make the sort of effect which is thus produced. On a b cessuring apparatus upon the image, he has to make ma sort of estimate of its mean position and set on that. It is really surprising how accurately this upon teat. It is really surprising now accurately this can be done after long experience, but the unstead ness of the object is bound to set a limit to the accuracy which even the most practised observer can obtain. Now it might be thought that this constant vibration of the object would be more fatal to the phohration of the object would be more fatal to the pho-tograph than to visual observation, but this is not the case. For the motion is very rapid, several times a second does the star make a small jump from its mean position and return to it, and, on an average, mean position and return to it, and, on an average, it jumps every way with equal frequency. The con-quence is that the photographic plate, which keeps a record of every jume, produces to the end an limage which is certainly larger than it ought to be, but which is, as a rule, entarged causty in overy direc-tion, so that its center remains still where the center of the image belongs. And whou the plate is put under the microscope of the measuring machine— derive capable of averaged pretermining a fitty thos-derive capable of averaged pretermining a fitty thossandth of an inch—and the threads which are moved by the measuring screw set upon the photographed image, the anlargement of the latter is more than com ated for hy any advantage which accrues from a stondy Image

But the superiority of the astronomical photograph over visual observation is not confined to the star chart Numorous articles in popular periodicals have acquainted the general reader with the wonders of the acquainted the general reader with the wonders of the nebutie as revealed by the photographic plate. The camminative effect of light upon the latter randors it possible to obtain expisite declineations of faintly luminous objects by means of a sufficiently ions cause. Vast hew regions of space are that he large plored, and still waster regions await of "plor axplora tion Prof E Bay Lankster, in an 350res before the British Association, gathed that "the invention of the dry size which he model it possible to another the dry piste, which has made it possible to apply photography to astronomical work is the chief cause of the great expansion of astronomy since 1881. To of the great expansion of astronomy since 1881 To quote Prof Lankester further "It was the dry plate which made long exposure possible, and thus enabled astronomers to obtain regular records of faintly un onus objects, such as solvins such as star spectra. Houghly opacing, those rishle to dept danked eye may be such excepts to 100,000.00 But the number which cappes to 100,000.00 But the number which cap hydrographed is indefinite, and disposite on length of the photographed in indefinite, and disposite on length of the contraction of the contraction of the contraction. photographed is insumine, and upper to be no re-exposure, 100,005,000 can certainly be so re-oprided By the photographic method hundreds of new variable stars and other interesting objects have been variance stars and other interesting objects have been discovered. Naw planets have been detected by the hugdred. Up to 1881, 320 were known During 1881 only one was found, namely, Shophania, being No. 220, discovered on May 19th. Now a score, at least, are discovered every year." overed every year

dishovered every year".

The appearance of Helley's comet this year suggests the fact that some of the most extraordinary revisions of photography in astronous have been into see for these strange nambers of the solar yatem Thy part dies and benuty of consist redest them very liable to flettychances from other celestral bottles. The photographic Blate has shown that the comets next representation of the second of the s this temous body has been photographed.

According to Prof G. W Ritchey, of the Yerkes Ob

seriatory, it is now possible, with the aid of improved of the had metherics, to construct a photographic re-

Secting telescope with as much precision and refinement as have been expended upon the great retracting telescopes. Prof. Ritchey has obtained splendid results from his two-foot photographic reflector, and his photographs thus obtained of the nebule baye a wider appeal than to the scientific mind alone To many a person untrained in astronomical lore, indeed, the pho-tograph of the great spiral nebula in the constellation of Andromeda, obtained with the Yerkes two-foot re of Andromeda, obtained with the verkes two-toot re-flector, would probably appeal at once as that of a most marvelous spectacle—a vast planetary system in the making About the same proportion of the ann to the planets in our own system is to be observed in the great central spherical condensation of the whirling mass and the smaller condensations in the latter of these smaller condansations, at varying distances from the central semi-formed orb, have assumed an almost perfectly spherical shape, others, again, are formless, though vastly denser than the nehulous mat ter extending, in a circular or elliptical form, through out the antiro spiral system It may be observed that the spiral character of this pebuis was never oven sus the spiral character of this nebula was never oven sus-pocted until it was photographed in 1885 by Roberts with a reflecting telescope Yat the result then ob-tained was crude indeed when compared with what was obtained by the instrument at the Yerkes Observaobtained by the instrument at the Yerkes Observa-tory Seen by the naked eye, this great unbuls ap-pears only as an indistinct hazy spot among the stars. The greatest visual telescope in existence fails utterly to reveal the amazing spiral structure so hrilliantly shown in the photograp

shown in the photograph Undering from the results obtained with the two-loot lankrument Prof Ritchey estimates that an eight foot reflector, it used in a climate where there are suitable atmospheric conditions, would photograph stars which are fifty times failnet than the failnet stars which are be seen with the largest modern re-fraction "This mean," says Prof Ritchey are such a reflector sould enable us to posterial seven to the stars which are some the same of the such a reflector sould enable us to posterial seven to the same of the same of the same of the same of the such a reflector sould enable us to posterial seven to the same of same of the same of the same of the same of sam times farther into space than can now be done with times increase into space than can now be done with the greatest visual telescopes, and thorefore that such an instrument would reveal to us a naivorse sevon times soven times sevon—more than three hundred— times greator than the uolverse which is revealed by of no opportunity which has ever been presented to the entire history of astronomy greater than that which now awaits us in the construction of a large modern reflector and its use in astronomical photog-

It is estimated that the cost of such an instrument It is estimated that the cost of such an instrument as Prof Ritchey advocates—that is, one of eight-foot aperture, and embodying the latest developments in optics and mechanics—would be about one-thritieth that of building a batticehip of the 'Dreadnought'

The Current Supplement.

One of the most important articles in the current Supplement, No 1796, is that by George Noumann, in which the compnisory working of German patents is ed, a matter of great importance to American discussed, a matter of great importance to American manufactures. The adhesing of icomolives is a most important factor in designing engines, and must be considered at overy step in the preparation of a gen-eral design. An article on this subject appears in the curront Structurest Ross's excellent description of a profile puppet show, and how it can be made and used, is continued. When abbiquiders common torning out from and steel vessels, navigators found themselves confronted with the problem of overcoming the magnetic forces of their ships and making compass needles point toward the magnetic their compass needles point toward the magneti-north How the problem is solved is told by William C Ward in a paper entitled 'Compass Deviations' Frank C Perkins writes on Canadian pulp making in the Algoria district, Ontario Irish linens and some features of their production are discussed by Sir William Crawford

Three kinds of bench marks were used by the United States Geological Survey in the apirit leveling in Ohio from 1898 to 1908, inclusive, according to a bulletin by Messrs S. S. Gannett and D. H. Baldwin The first form was generally used in the vertical walls of public buildings, bridge shutments or other substantial masonry structures, being a circular bronse or aiuminium tablet, 1% inches in diameter and 14 or aluminium table, 1% inches in diameter and My inch thick, appropriately lettered, and having a 3 inch stem comented into a drilled hole. The sevond form was ompleyed whore massney or rock formation was not accessible, and constant of a holiow wrought trop post, 4 retti ong and 3½ inches in outer diameter, split at the bottom and 3½ inches no as to reasts pulling from expanded to inches so as to reast pulling from the ground—after half-posts were sunk 3 feet in the ground—after half-post were sunk 3 feet in the ground—after half-post were sunk 3 feet in the ground—after half-post was the sunk and the sunk a bean coated with asphalt—and a bronze tanies similar to the one aiready described was then riveted to the top. The third form was little used and is now alto-gather discontinued, being the ordinary split boil of copper, I tech in diameter and 4 inches long

HOW TO ESCAPE FROM A SUNKEN SUBMARINE

METHODS APPROVED AND DISAPPROVED

in a diving manual recently published by Biebe, Gorman & Company, Limited, submarine engineers of London, we find some excellent suggestions on the subject of saving the crews of submarine boats.

subject of saving the lives of a crew of a auto-marine vessel is by no means easy of solution. The equipment and apparatus which is invaluable on ahore to quite useless under water. It would be quite easy to construct a submarine boat, the crew of which ic ontic nuclear under vater. It would be quite cast, on construct a submarine boat, the crew of which would be afte under practically every conceivable set (irrumentaries, but such a vessel would be so ham jerred by her safety devices as to have little or no military efficiency. In the opinion of Mesers Siebe & Gorman It is easential that the salvage of the vessel and of the crew must be looked upon as entirely separate inevitable delays in the sarvivat of the salvage and the crew number of the salvage creation and the crew that the salvage of the vessel is in the salvage of the salvage creation of the salvage of

ilt water comes into contact with the battery or

the sait water comes into with the terminals of the dynamo, if this be still working, chiorine is evolved, and the air remaining inside is vitiated

maining inside is vitiated

If anything is done, it
must be done quickly Accordingly, the following
steps must be taken

(a) To render the crew

(b) To preserve the drowning in crew from

crew from drowning in the boat, and (c) To provide means of escape from the boat, and ascent to the surface The devices to bring these about at present

(1) Air locks for es-

(2) Detachable cham. bers or life boats. (3) Belf-contained dress

Air locks slope are of Air locks sione are of little use except in shal low water, but combined with (3) or (3) are es-septial in all methods of septial in all methods of escape The air lock may be a portion of the boat provided for the special purpose, or the general cavity of the boat may be used in which case the pressure inside the vessel can be made equal to that of the water outside by simply allowing the water to enter for it is mani feetly impossible to open an aperture until the pres-sures at both sides of it are equal. The great ob-jection to all forms of deboats is their size weight. and resistance, if made large enough to contain all the crew of a modern submarine, and as such a submarine, and as such a chamber would have to be carried as a superstruc-ture, it would be in the His-liest position to be injured in case of collision Moreover, what is further against any device of this kind is that the crew are expected in a moment of considerable excitement to undertake an entirely novel operation which there is no means



rm on the left shows a longitudinal section arise, showing an air trap in ose, three men owning-tower that on the right a transverse of a subsaries, showing sir-traps in so in the sir traps, weering sainty-beimets, congright from the continuations.

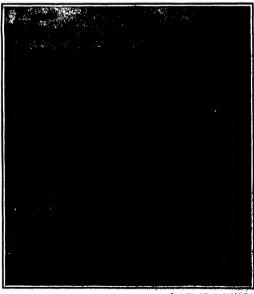
of trying previously Experience has shown that even plain drop asiety weights fall at the critical moment. A life-awing device to be efficient must be able to faith promptly the three conditions, a, b, and c, previously referred to, and is order to meet them a special form of diving heimet has been designed by Messra. Sible & Gornaus which is quite self-contained and not dependent on any feature which is inhie to get out the hand free mevement, is sloped away to fit the shoulders, and is connected to a hort factor of the shoulders, and is connected to a short factor of the prevention of the placks, inside, is a pocket containing a combined as in purifier and organ generator, consisting of two small chambers

formed in one case, These chambers are charged with the patented cubetame which, when in conque with the water vapor of the breath, gives of pure expans patented customs which, when it conque with the water vapor counted abault. The alkall in its term taken up the carbonia and gas of the received ake side, forms an initialize carbonaia. In this way, or is space, the counter of motion behaved the same also particle has deep to the counter of the counter

r.moval of the weights.
At Portsmouth the British Admiralty have in use a
huge water tank, at the hottom of which is erected a
skateton submarine beat, serving the purpose of permitting the men to exercise in the helmet described.
The men having first been trained to put on the dress

trained to put on the dress guickly are set to practice getting into and out of the sir look. They are after-ward lowered in the air lock to the bottom of the tank, where they earer the submarine, and find their way to a ladder leading to the country tower, the hatch of which they open. They then either Sout to the surface or return to the starting point, the operations being repeated until the officer in charge considers the men producent. These arrangements have been designed to represent as nearly as possible the same conditions as would obtain in a submanish but the same conditions as would obtain in a submanish but that had been

If the hole in the sub-marine be at the top, the water will gradually dis-place the whole of the air place the whole of the air It, however, the hole is he-low the top, then the wa-ter will easily enter unit the air, which cannot ca-supe, has been compressed such it is pressure is equal to that of the water out-tide. In the latter case there is no difficulty in getting at and putting on nermet dress, pince there is air inside the ball. In the foreger case, hewever, unless some special pipovision were made. this would not be



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ARTIFICIAL RADIUM BATHS AND DRINKING WATER

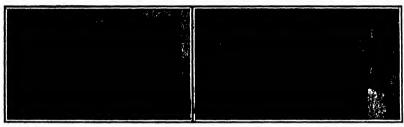
BY DR. ALFRED GRADENWITZ



Until quies recently the curative effects of mineral vateley were serviced to the obsenical substances held as solution. The lack of mineral solvents in some waters of remarkable interapeutic value could not be explained on this principle. Moreover for some un socoromable reason it was observed that most waters sometimely properties when taken at come bace distant from their course.

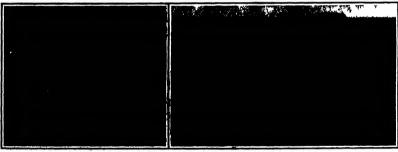
All these contradictory phenomena can now be

plausibly explained by sacribing part if not all of the curaitre powe radioactive a be ano s in far to rearly all miseral waters have been found to con tain radioactive enamation. This emanation being an extremely massible body most waters lose their activ-ity in a low days so that the curaitre ag nt canno careful action unless the water be administered as soon as possible arter issuing from the ground. Only a few waters containing radioactive substances caps



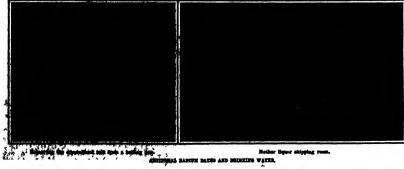
Laboratory for obtaining highly concentrated radioactive substances,

ntery for course chemical proce



Washing plant for radioactive tabglames treated by chemical proce

tioneral view of the famous Krenmach vail v



Mother liquor shipping room.

ALEXANDER GRAHAM BELL AND THE TELEPHONE

THE STORY OF A GREAT INVENTION

The telephone was first introduced to the public in The sisphone was first introduced to the public in 1876, and put to the first practical or commercial use in 1877. During that year was organized the first sescritation or company to hold the patient. The first companies which systematically exploited the business was tree formed in 1876, one for New England and one for the rest of the l'initial distates and Canada. These two companies succeeded to all the right and property of the original association. The explait represented 1763, one to when the companies were consolidated in the control of the patient, and \$100,000 in cash. Early in 1878 these two companies were consolidated into one company claims or considerations. into one company called The National Bell Telephone Company, the first company to attain any prominence The capital of this company was \$850 000, deposited among \$500 stares of \$100 par velue each. The sum of \$850,000 in sheres wes given, shere for share, for the stock of the two old companies, and \$200 000 in

of 950,000 in shares was given, shere for share, for the stock of the two old companies, and 250 000 in shares was left. In the treasury. This treasury stock was sold for the best price obtainable, as the most was required and yielded eventually \$43,000 in cash for last 100 and 100 and 100 and 100 and 100 and was required and yielded eventually \$43,000 in cash for last 100 and 100 and 100 and 100 and 100 and for last 100 and 100 and 100 and 100 and 100 and for last 100 and 100 and 100 and 100 and 100 and formidable and powerful com-petitor was removed grow the field. Then it was that the stock bosones, The facts in the stock bosones, The facts and 100 and 100 and 100 and 100 and athough that price was probably never actually paid at the highest quotation, a total market value of all the shares of the company would have been \$8,500, ever give the company. Because of the rapid increase in busi-ness, more capital was required, hence of the original in research busi-ness, more capital was required, hence company was organized and the business of the National Bell Telephone Company, transferred to it. The sharebolders of the National Bell Telephone Company, transferred to it. The sharebolders of the National Bell Telephone Company, transferred to the Telephone Company, were given for each stars of their stock-thone Company's slock. At the same

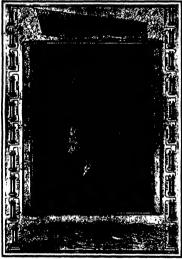
were given for sech share of their stock six shares of the new American Bell Telephone Company's slock At the same time, 8500 shares of the treasury stock were sold at par in 1881 the first degined was paid.

The American Hell Telephone Company continued in business until 1899 during which time the capital stock had

d from \$5 950,000 to \$25,886,300 increased from \$2.950,000 to \$25,885,000 When the American Bell Telephone Company fransferred its business to the Auturican Telephone and Teleprach Company, there had been over \$25,000 on actual cash paid into the treasury of the company by the shareholders as against \$25,885,000 capital outlanding During the time no stock dividend by a dividend of surplus in cash to be for stock leased was paid. The married price of the American Bell Telephone Com-

of the American Bell Telephone Com-pany's share during the year rauged above 8100 e share, and the company was paying; 15 per rout dividends yearly The demands of the business required much larger capital thes could be provided under the corporate powers of the American Bell Telephone can pany Hency, the American Telephone and Telephone

corporate powers of the American Bell Telephone Company Henry, the American Telephone and Telephone approach the tom-distance of the American Telephone and e of the cavities of the mouth. It was not long before he learned that Helmholts had not only made the same discoveries, but had produced the sounds of the vowels by combinations of tuning forks, operated by electro-magnets. In order to repeat Hambolt's ex-periments, Bell began to study electricity In 1872 he constructed an experimental apparatus in which each transmitter consisted of a tuning fork with its prongs between the poles of an electro-magnet. Current was between the pose of an electromagnet. Current was applied intermittently by means of a wire which was attached to one preng of the fork and alternately and and broke the contact with a cup of mercury as the fork wheated. As the prongs of the fork were attracted by the magnet each time the current was ap-plied, the fork was kept continuously whrating and sounding 83 pressing a talegraph key, the intermit-tent current was sure through the line wire to the re-civing instrument, which constitted of another electro-civing instrument, which constitted of another electroceiving instrument, which consisted of another electro-magnet and tuning fork if the receiving fork was exactly in unison with the transmitting fork it was also thrown into vibration, but if it was not in unison it remained stient, because the pertional currents did



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ALEXANDER GRAWAM RELL

nkt vacch it with the proper frequency to cause it to vibrate. It was Bell's lice to use several transmitting forks of different pitches, and as many receiving forks of different pitches, and as many receiving forks only the particular receiver that was in unknow with only the particular receiver that was in unknow with a set a simultaneously owner a state plate of a state plate of the state plate not reach it with the proper frequency to cause it to vibrate It was Bell's idea to use several transmitting

current, instead of being intermittent, was undulatorr, varying in intensity and direction in exact scores, as more with the motion of the transmitting read. The two instruments were exactly alles, and either could be used as the transmitter. Several such pairs of first transmitter, Several such pairs of struments, of different pitches, could be employed, with alles wive connecting the two extations, and the pitches liqu of the pitches and the struments of the several sever

in the control of the the instrument, and as he labored to re-move them, it occurred to his that the best form of phonanticgraph would be an imitation of the human ear, in which the sound waves are likewise received by a membrane, the see drum, and the vibra-tions are transmitted to the inner ear by a series of bose levers. Dr Blake, as aurist to whom Bell applied for precise information, concerning the streams of aurist to whom Bell applied for precise information concerning the structure of the ear, suggested the employment of a real human ear instead of an imitation An nantomical specimen was prepared, with a fine straw attached to one of the bone levers to serve as a writing point, and Beil experimented with it in 1874, while be was still working with his reeds and electro-magnets

and electro-magnets

Another possibility had occurred to
him. He knew that when a vowel sound
is sung into an open plane all the strings
that correspond to the overtones, which
give its sound its vowel quality, as well
as the string corresponding to the fundamental tone, are set into vibration, so

arive the sound its rowed quality, as well as suring corresponding to the transmission of the suring corresponding to the transmission of the suring corresponding to the transmission of the suring transmission

MOTION APPARATUS FOR AMATEURS

AN INGENIOUS FRENCH INVENTION

The production of photographs of noving objects has hitherto been desided to anatoms, for various reasons. It requires complicated and costly apparatus and delicate manipulations which cannot be performed without special appliances. Of the control of the contro

small perforations, causes the disk to rotate intermit-tently, pausing after each advance long enough for e single exposure. At the same time the shutter is single exposure. At the same time the abutter is autometically caused to open when the disk slope and to close when it resumes its rotary movement. For the disk containing #4 pictures arranged in a circle, the bearing is fixed at the center of the plateholder, that for the disk with 75 spirally arranged pictures, the bearing is free to move in e vertical silde end, as the responsating pin engages successively with the sol raily arranged perforations, the disk is displaced in such a manour that each picture is meds in its proper piace in the spiral curve. In either case the move-ment of the netherism is automatically arranded when work and essentially similar to the mechanism em-ployed in making the negatives. But, as only a very feeting illusion is thus produced by the disks which contain 84 pictures, there is provided, for these disks ence, another apparatus which can be turned by and, slowly and for an indefinite time, showing the pictures repeatedly in their proper order A third form of agparatus is turnished for the purpose of projecting the pictures on a screen with a lanters

A writer in a contemporary refers to numerous failures of castiron fittings which were, however of the usual run of commercial caira heavy fittings of which meither the metal nor the thickness were sufficiently

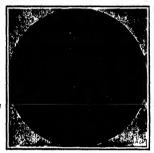


Fig. 1.-Disk with 24 plotures.



Fig. 2.-Watching the metion pictures.



Fig. 5,-Dick with 75 pictures,

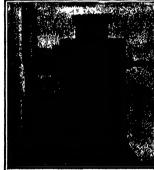


Fig. 6.—Apparatus for projecting the metica pictures.

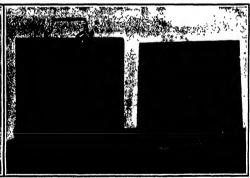


Fig. 8,-Cinephote camera and platcholder.

A MOTION APPARATUS FOR AMATEURS.

The Cinesphote comprises two distinct pieces of apparatum one for making the pictures, the other for exhibiting them in such a manner as to give the illusion of movement. Both of these devices work automation, by means of very simple mechanism. The languity, by means of very simple mechanism. The languity, which are either \$4 or 75 in number, are made on a circular sensities of just, on which in the Spictures with the sensities of pictures. on a circular sensitised pints, on which the is pictures are arranged in the form of a circle, whith the 75 signs and circular should be supported by the stress of the form of a circle, white the 75 signs and circular should be supported of the stress are a supported by the stress of the stress above. In sidier case, the slight is pictures and with such boles, equal in number to the pictures, and with a stop of \$\sqrt{1.5}\$ and distributed at open an angular behavior of the stress of the

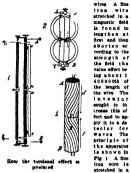
a covered are the control of the con

good. The growth of cast Iron under repeated besting is discussed and reference is made to Outerfrigg's work. Steel sittings have also fatted, within
the suthor's experience only four out of twenty fire
steel gate visive, 6 luckes, 8 inches, and 10 inches in
dismeter, were fairly tight efter one year's service
to dismeter, were fairly tight efter one year's service
to trapidly develops them Gu on iron is high gradcast iron having a tensite strength of 30,000 pounds
or more, and is adopted for 150 pounds of steem with
300 deg F superheat Analysis of various specification
from the steel of the steel of the steel of the steel
tensity of the steel of the steel of the steel
tensity with the steel of the steel
displays of the prevent phosphorus 0.85 per cent,
managanese, 0.45; total carbon, 2.45, combined carbon,
617 Low sitions, phosphorus, and carbon charactertes \$t.

AN INGENIOUS TORSIONAL WAVE DETECTOR

BY THE PARIS CORRESPONDENT OF THE SCIENTIFIC AMERICAN

Prof A G Rosal of the Royal Polytechnic Institute of inrin has decised a new form of detector for use it wirehes telegraphy with its of special interest because f the novel prin like it employs He uses the 1111-112 known as magneto striction found in



promises
stretched to a
vortical post
ion between two fizzd points A R. Two can
stant magnetite fields formed by two equal to
make a magnetire the wire in two halves in
make seas with the intensity J and
longitudinally as shown by the strows At the
same lim a cur in is sent through the wire from
\$100 in and bits give a circular magnetization to the
wire with an intensity in result of the coubland magnetif if his will be a magnetization of helical
form J. Upring to the effect of magnetostretches and the strong to the strong to
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wire will have a torsion represented at σ in the direction of the arrow, this being what is known as the Wiedemann torsion effect. Leaving the longitudinal field as it is if we reverse the current in the wire the Wiedeman torsion effect. Leaving the longitudinate field as it is five regress the current in the wife the torsion effect will be also reversed. When we send an atternating current through the wirt we have a steven its sense A mirror pinced at the middle of the wire its sense A mirror pinced at the middle of the wire its sense A mirror pinced at the middle of the wire the made to redect a boam of tight on a serses and the spread of the beam shows the amplitude of the virtual time. The effect is much stronger when the priod of the atternating current is of the same write as the coreal whention rate of the wire, and we have a of about 0.02 millimeter diameter, and is had under the middle of the wire project three hands and at the middle of the wire project three hands and at the middle of the wire project three hands and at the middle of the wire project three has been at the middle of the wire project three has been at the middle of the wire project three has been at the middle of the wire project three has been at the middle of the wire project three has been at the middle of the wire project three has been at the middle of the wire project three has been at the wire of the wire project three has been at the wire of the wire project three has been at the wire of the wire of the wire of the wire of the wire of the wire of the wire of the wire of the wire of the wire of the wire of the wire of the wire of the wire of the alternating current and the breake of the wire wire wire wire wire the support 5 feet from the foor Light alternating current three the support 5 feet from the foor Light alternating current three the hostone to ground with acts at the strong the summer of the terminals a bare connected to a pair wire difficult to the strong and current through the wire. The copper spiral is forted the top of the proper man to secure a very small current through the wire. The copper spiral is forted with the wire with the beattenn and at the botton to ground with accts at transpensent the flustrate, above the wir torsion effect will be also reversed. When we send an With such an arrangement the instrument shows the effect of waves received from a distant station and

we notice variations in the beam of light due to this cause. It is designed especially to be used for reneir-ing alguals formed by a succession of waves, such waves to follow each other in series so as to fixed periods of low frequency. The frequency in Sirsi and periods of low frequency "the frequency is first as justed so as to be the same as that of the vibratia wire Besides the tuning of the high frequency wave this allows us to use a second or local tun-

a second, or local tun-ing of the low period waves it should be remarked that Prof. Rossta is at rument transforms directly as electric vibration of low frequency into a mechanical vibra-tion and contrary to other detectors, there is no transformation other detectors, there is no transformation of energy between the effect of the name and the registered optical indication. It is thus indication It is thus extremely sensitive To have a permanent record of the signals, the author proposes the use of a photo-graphic band descend-

ing in front of the beam and as the variations of the lat variations of the lat immediated vibrations. The case of varyline is a real varyline in the case of varyline signals printed on the hand. By using a selentum cell which is lighted by the beam we could write a lighted by the beam we could extreme enough light in reflected by the mirror on the cell of the case of the cell of the case of the cell of the case of the cell of the case of the c

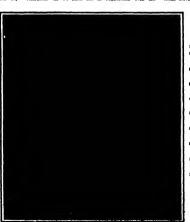
THE HEIGHT OF THE ANTARCTIC CONTINENT

BY WALTER LANGFORD

Our knowledge of the Antarctic continent is daily be oming more precise. Soon after Shackleton's memeral le dash toward the South Pole had furnished very

craile dash loward the south Foir and in limit that dais in legard to the interior if the continent Charlots voyage sup-if d valuabl additions to our knowl day of the boundaries of this wast terri-lov. The Frinch expedition succeeded in surveying a trately a great many miles of coast line that had previously best entirely unknown or only conjectur

the results of those expeditions prove it at the mass of land accumulated about the bouth Pole is even greater in com-justmen with the other continents than paison with the other continues than
and previously been supposed. The eletit is involved in this comparison in
but an estimat of area and a detorination of the heights of the mountain
mass a Both of these elements require
act and emprehensive surveys. The Lightern was first attacked by Humboldt at an 10ch when our knowledge of the folds cathetes of the mean elevations of the known continents above the sea of its known continents above the see hold are far too low. This mean clera tion is the hight of a firthfour places to the first the high of a firthfour places to the first the quotient debands by dividing the volume by the area. Humboldts estimates of the mean **settlend of continents are Funge 6." feet North America 758 feet South America 1151 feet Asia 1 to first entire known and surface of the globe 100 feet Execution of the continents of the side 100 feet Execution of the continents of the side 100 feet Execution of the continents of the side 100 feet and the continents of the tion and accurate surveys although a general estimate can be obtained from elements of a totally different character as we shall see in connection with the



REAL PROPERTY OF THE OPPOSITIONS.

Antarvic continent Kruemmel who was the next after Humbolist to attack the problem estimated the mean elevation of the outler known hand surface of the outler known hand surface of the surface of the continent

occupied by Asia. The exact and ex-tensive knowledge which we prov-position in regard to the other outsi-nesses in still fashing in the ones of the Antarctic, of which we know out; the few points that have being reached by

Methanolius has metanorumed to deter-mine the height of the Astroprise sensi-tests from metanorum; dett. Print-test from metanorum; dett. Print-test from metanorum; dett. Print-serve pile, the develope of printers of the formal file for printers of

Scientific American 465 CURIOSITIES OF SCIENCE AND INVENTION

REVIEW A TOWN MY BALL.
Plotteped herwith is a trainlead of houses on the
Weakleford, Mineral Waits & Northwestern Ballway
in Years. There are five flat care loaded with intervigia Years. To come seek, seek from being 1 by 14
by 5 feet. Entreme beight above the care in 15 feet &
inches. In addition there are two care containing the

ENGINE WITH MEABLESS CYLINDERS. REGIFA WITH CHARLES CTLINDER.

In order to produce a completely-balanced engine, an inventor has recently adopted the unique plan of providing the engine orplinders with two pistons each. The steam enters between the two pistons, separating than This readers the orplinder heads uncleas, for there is no reaction against them. One of the pistons is provided with a bollow piston.

rod to receive the rod of the other piston. The engine shaft is provided with two cranks at is provided with two cranks at right angles to each other, which are respectively connect ed to the two piston rods. Thus a forward and backward impulse is given simultaneously by the is given simultaneously by the steam entering one cylinder, and there is an equal distribution of the load When the pistons reach the end of their stroks, steam is admitted to a second cylinder of the same type, which

steam is admitted to a second cylinder of the aame type, which repeats the operation white the first cylinder exhausts. There are no joils, strains or vibrations, as the forces are entirely absorbed in mo-The ends of the cylinders are preferably closed tion The ends of the cylinders are preversuly cases by multable doors, to prevent dust or other extransous matter from entering and choking or clogging the working parts. These doors are shown open in the accompanying photograph. The model illustrated has wn remarkably high efficiency, and is so perfectly

of the air cushion, and as they are constantly in con tact there is no wear This ingenious little machine tact there is no wear. This ingenious little machine will hime a 16-4op or larger organ silently and with very high efficiency. It requires no sitention, and current sufficient to run the motor is obtained by connection with an electric lamp socket. As it is practically silent and occupies a surface or ninty 51 is inches end in 25 inches to beight, it can be placed on the 500r bedde the instrument. The speed of the motor is constant, but automatic control of the pump ing is provided by a chain connection between the swinging bracket and organ reservoir or believs. By means of this chain the motor and hemisphere may be drawn through an arc of 90 degrees into the position orawn inrough an are of 30 degrees into the position of full organ, while a spiral spring riturns them to the neutral position, as shown in the illustration. The rising and failing of the reservoir thus cause the speed of the belows handle to vary from zero to maximum, and keep the believs full automatically

here and the tire, owing to the clasticity



erewith was The peculiar flying machine illustrated herewith was one of the nevelties at the Clympia Arro Show held recently in London It is the invention of Mesers, recently in London e and Ottine, and consists of a large number of small planes arranged in an endless band and driven somewhat after the manner of a tread nill, the idea being that as these planes move along from one end of the machine to the other at a rapid rate they produce



SECTIONAL VIEW SHOWING CROSS CONNECTED PINTONS.



A WHADLESSLOYLINDER RALAMORD PRINTERS

halanced that it will run smoothly on the filmelest of

A HOVEL AUTOMATICALLY ADJUSTABLE OBSAN

A novel nethod of dapting sectric motive power to organ blowing is shown in the accompanying en-graving. The mechanism comprises an accurately turned homisphere of aluminium driven by a small sectric motor faced to a breaket swinging horizon-



VLYING MACHINE WITH A TRAVELING CHAIN OF LIBTING PLANES

a lifting effect owing to the slight angle to the heri sontal at which they are set. As they move around at one end in passing from the bottom to the top they one end in passing from the bottom to the tup they are at an angie to the heritostati and still produce a lift, white as they descend at the other and their machine was resulted to the contract of the contr A SEPPENTINE WHARP

One of the longest whereves in the world, almost a mile in length, art to be exect, 4 700 feet is at Port Los Angeles, Cal It extends into the Paulis in a long serpentine curve. The reason for this countries into its that it offers better resistance to the strong currents and the buffetings of the waves than if it currents and the buffetings of the waves than If it were perfectly straight. Until the nearly harbor of Ban I odro was developed by the Foderal government, the big where Angeles was a very busy place, but of late it is comparatively seldom used ux cept by the Japanese Schermen, who have formed a colony atong the adjacent beach



A SERPENTINE WEART MEABLY A MILE IN LEBOTE.



A TRAINIDAD OF MINERS COTTAGRA

issa-to hitchens, and two cars that carry other wreck-age of the coal-mining town of Rock Creek, Taxas, whose mines were abandoned The train was moved successfully at the rate of 15 miles per hour, and around a number of six-degree curves having the outer rail elevated four inches.

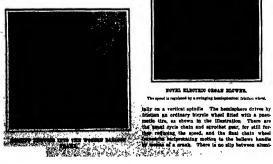
When the Zeppelin balloon was destroyed in a thun-der storm two years ago it was asserted that a static discharge of electricity from the metallic frame of the discharge of electricity from the mechanic frame of social balloon had ignited the gas. To obviate such an acci-dent in the future, a German inventor has devised a balloon having a wooden frame, which he claims is

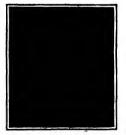


A BALLOON PRANT FORWER OF WOODEN STRIPS.

A SALIGORY PARKY NORTH OF OF WOLLD STATES.

NO only lighter than aliminism, but is stronger as well. A frame thus constructed was exhibited at the result of the production less summer, and proved quiet as attraction. The accompanying photographs show the frame is made up in a network of wooden strips which is very strong and yet possesses a considerable degree of festibility. The model illustrated is 65 fest long and 8 feet in diameter. The meshed the selection of the selection of the selection frame makes a more efficient support for the savelope of the balloon when the gas is standed by the bast of the sum another advantage of the wooden frame makes a more efficient support for the cavelope of the balloon when the gas is standed by the bast of the sum another advantage of the wooden frame is the fact that it can be regalized with possels apparents and by an experienced worknam. The wooden frame is not affected by heat or cold, and may be rendered waterproof by consing it with a suitable varnish.





HOVEL ELECTRIC CREAM BLOWNS.

The spend is regulated by a swinging hemis

REGENTLY PATRICTED INVESTIGATE.

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Bit.T.—O. W. Raux and P. B. Gamm.

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Full hints to correspondents were printed at the head of this column in the issue of March 18th, 1980, or will be sent to wait or prepared.

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The revolutions of the rotary

will be 160 per minute

The effective stroke of the rotary on
gine will be 17 feet.

The clearance will be 12 per cent.

The clearance will be 12 per cent.

The stroke, plus the clearance, will be qual to 19 feet.

The distance swept by the piston w hour, allowing for clearance 19 × 160 × 60 == 182,400 feet.

The total cubic feet of steam to be $390,000 \times 2.2 = 1,248,000$

The area of the piston will be 1,248,000 - m 6 85 square feet. 182,400

Assume pistons 16 inches high, 6 85 × 144

16 × 8 oh piston. (3 in all.) The borse-power developed by the ro

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78 × 17 × 6 85 × 144 × 180

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Assuming 5,000 B. H. P., with a propaller efficiency of 60 per cent.
The turbines will give out 30,000 B. H. P.

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(Continued from page |W|)
nother liquor this process the mother liquor this pro-

complicated and expensive The brine is vaporized in graduating works, the output of which depends on the season, the direction and intensity of winds, as well as on the temperature and moisture of the air Each of these graduating works (the total length of each is approximately 25 kilometers) is each is approximately 25 kilonieters) is divided into seven compartments of de-creasing lengths traversed consecutively by the brine, and the sait content in-creasing as each compartment is trav-ersed. After leaving the last comparireed After leaving the last compan-neut the weak solution is from eight to twelve times more concentrated. The bramble walls of the compartments are exposed to the wind. Hence operation of the plant is difficult in variable which On the other hand, the surrounding att with stomized brine, not only makes the graduating works a very cool and pleasant place to stay in on hot days, but at fords a welcome opportunity for utilizing the curnity effects of the refreshing alt alr

sait air.

The pumps of the graduating works are operated by a number of water whele the fed from the river Natie through a system of canals. From the graduating works the brine is pumped through conduits to the reservoirs of the evaporating house, in order there to be holled. Both the evaporating house and graduating works dute from the indelle of the

eighteenth century when the Salines were erected the ancestors of most of the workmen employed therein having spent their lives in the works

The primitive boiling process carried

The primitive boiling process carried out in open sail pairs has recently given way to a modern multiple vacorizer with improved devices for recovering the mother liquor sand the sail it consists of a steam boiler and a number of vapor increase an interpretable of the brine and multipretable of the brine and the b

As the noting of the arms and mather inquer is carried out in women at low tem perature the decomposition of valuable chemical compounds is entirely grevented, thus increasing the curative effects of the products

the products
When the brine has been boiled down
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grammes of common sait a supersatu
rated solution is obtained from which the sait crystatizes. As the concentration of the brine increases then increasing amounts of saits are senarated, which imart to the saits an seid taste. These saits re pard for various theremently purposes while the brine left after the separation walls the orne per site of the common sait forms the mather iliquor used for other therapents purposes and of which about 35 until the same produced per annum For shipping great distances, the mother liquor is further concentrated until it crystallizes in

shown that the Kreuznach water con shown that the Kreiznach water con-tains not only pleutifut amounts of gas-eous radioactive emanation but carries along from the intrior of the earth ra-dioactive substances. Part of these sub-stances as the water during the graduair will separate along with iron oxide calcium and barium carbonate while an other part remaining in solution forms to other part remaining tu solution torans in the brine a permanent source of emans tion Experiments made by Eister and Geliel, as well as by Dr K Aschoff, have shown that the residues contain not only considerable traces of radium, but radio lhorium and actinium as well. The mother liquor derived from the Kreuz The nach hrine as well as from the bathing salt was likewise found to be strongly radioactive. Further experiments demon strated the possibility of isolating traces of radium from the residues of concenof radium from the residues or concer-trating the radium salis. As the springs of Kreuznach yield every year radioactive residues by the hundredweight it was desimed advisable to attempt the production of radium saits on a large scale (Concluded on page \$70)

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SALE AND EXCHANGE

HUE HALE, Engine lates. Our remain #1 comp etc, with a farm plate 1 we contern wice of a last of change re un to ru all size through which the last of Inquiry No. 8075 Wanted to by small we wanted to by small we wanted to be companied to ingle inquiry he 8878 - Wanted the addr to Cabada who could make a safety range A 1 18T OF 1,250 manage and consulting engineers outdo A very valuable list for concutarials if Price study Address tions & Oc., It is 1 but been at the San I at the price of the list been at t inquiry No. 9077 Wanted the address of mans that you're that make annal articles of wood start as

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I negative No. 90001.—Wanted the manufacturers of the question inquiry Yo. 9899 -Wanted address of a Inquiry No. 9161. Wanted addresses of manufactures of a sip or magnetic needs, for exploring for

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Inquiry No. 9163 - Wested, mars!

Neumann, Director of to lines undertook experiments according method worked ont by Dr Aschoff of the wings of the bolling house onverted into a radium factory as been operated for over a year entire annual production of active resid ues is now worked into radium salts an end which has made possible an exten sive therapentical use of radium com is, both as a white insoluble pow der of high radioactivity for compr ointments, etc or directly in a dried con dition, and—on a far larger scale—in

An apparatus perfected by Mr Neu-mann renders it possible to determine be amount of emanation imparted to s

ted to water

Mr Neumann has recently worked out Mr Neumann has recently worked out an improved charging method which is especially suited for imparting to any liquids a very intense activity (2000 to 50 000 Mache units) However no de-talls as to this method have as yet been

nads known Satisfactory results have been obtained Satisfactory results have been obtained by treating, by means of charged drink ing or bathing water chronic rheuma-tism of the joints, and gont, while a number of other complaints are favor ahly acted upon

those physicians who have tried the ra-dium-water treatment, is that many pa-tients at the beginning of the rure will show a striking reaction recreaseshes or some symptoms or use promaind, and in some oness in some trou plain in the general condition (insomnia, loss of appetite, etc.) In some cases this manual control of appetite, etc.) reaction manifests itself as a slight feel-ing of interioriton during the bath and

some minutes afterward, while other pa-tients feel especially refreshed and invis-orated. This reaction, which strikingly mbles the reaction produced by many natural bathing and drinking waters,

clusions to be drawn, it doubtless con-atitutes a valuable addition to the pres-ent methods of modern medicine

ALPEAUDER GRAVAW BELL

ALTIANTE CHARM SELL.
(Consissed from page 482)
tha free end of one of his freed to the couter of a membrane capable, like the ear drum of taking up any
kind of vibration. The fixed and of the
reed was not to be clamped but was to
be hinged loosely to the phatring mag
net, as that it would no longer have
any definite rate of vibration but would
follow all the vibrations of the membrane
and the vibrations of the membrane
that the longer have a second or the complex of the country of a receiver But the apparatus was not constructed at that time because Bell doubted whether the currents gene my the action or the voice alone would suffice for practical telephony. Further more, he was induced by his associate to devote his attention to multiple takes

One day in tuning and testing the clamped reeds of his transmitters and re-ceivers he found that the receiving reed ceivers he found that the recalving reed vibrated and sounded when the trans mitting reed of the same pitch was plucked although the battery was not in circuit This discovery convinced him circuit This discovery convinced him that the membrane speaking telephone dovised a year carlier could be made to work

The long and patient researches that followed cannot be here detailed. Mem branes with attached patches of iron and branes with attached patches of iron and sized of various dimensions were tried and the apparatus was varied in many other way. Then it was discovared that a thin abset of iron could be used as the membrane. Thus were developed, successively, the apparatus patanted in 1878, the telephones that created so profound a semantion at the Centennial Exhibition. in the same year the instruments par suted in 1877 and the familiar hand tele phone which with some modification atili universally employed as a telep receiver

at the production of an undulatory cur rent capable of representing all the com ponent harmonic vibrations of voca ponent harmonic vibrations of voc sounds This fact sharply distinguish his invention from the old Reis tel phone which, employing an intermitten current produced by altarnately making and breaking the circuit, reproduced only the pitch of a sound, but not its quality or fimbre and was consequently unable to transmit vocal sounds and artic

aperch

It is safe to say that no patents for
any invention have been subjected to
such long and bitter litigation as the
Bell telephona patents During one of
the many suits which involved the validthe many suits which involved the valid-ity of the patent Mr Bell was on the stand for fifty two days during which time he recited the history of his inven-tion with a clearness and conciseness that still characterise both his writing s (but still characterise both his writings and his specches as we see it today, the tatephone is practically the same in principle and construction as when it left its inventor's hands, so the sai the receiver is conterned from inventions have changed so little. To be sure, the superarrace of the apparatus has been greatly modified. The multiple switch have deal the common hattery system. cult art of telephone engineering has developed But for all that, the phone still remains the same in p

Professor Bell makes no claim to best on ability. He even states that hed is A been for his father-in-law, Mr. Emb (Concluded on since 2004).





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and the practical application of also-"The simple one is not the only art with "The simple one is not the only art with "The simple of the simple of the simple of the "The simple of the simple of the simple of the spirit experiments which, had they been spirit experiments which, had they been spirit experiments which had made on the Fotomean River had been to be fined to the simple of the simple of the simple to be simple of the simple of the simple of the simple of the core a mile is landowned the system of this article that an account of his work of this article that an account of his work on the Fotomea River which he gave to Precess in England, may possibly have the fined on the simple of

the experiments were conducted
Aerial locomotion is another art with
which Professor Bell has become identi His juterest in the subject was ed when, in 1880, he began to make kite-flying experiments, largely for the sake of his health. He started with a Hargrave box kile and eventually devel oped the tetrahedral principle, v open the terraneural principle, which is now well known among aeronauts. Dur-ing the course of his experiments he found that he needed the services of civil and mechanical engineers. Accordingly, a little association was started under the "Aerial Experiment Association." which included among its members the late Lieut, Selfridge, Gienn Curtiss, Buidwin, and McCurdy, all of them now win, and McCurdy, all of them now wen known. Baldwin and McCurdy acted ac-engineers, Curlies was the motor author ity. The association was Mrs Bell's idea, and was founded to carry on Mr Bell's own work. She sold the only piece of property which was here in her own right, and which had not been given to her by Mr Bell, in order to finance the association. Although these engineers were all originally engaged to help Mr Bell in his tetrahedral experiments, the Sell in and tetrahedral experiments, the numbers of the association ended by help-ing one another Selfridge was the first man who profited by the association's assistance. Belleving that it was best to follow in the footsteps of others, and then to improve on their work, he start-ed with gliders, and finally built the "Red Wing," which flew successfully ed with gilders, and finally built the Pad Wing. which few successfully Rest teams Baldwin's chance. He embod-read with the property of the pr



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served the purpose of keeping the members in touch with one another

HEIGHT OF THE ANTARCTIC CONTINUES.

(Concludes from page 46;)
concludes that. If the continuent covers an

(Concluded from page 464) concludes that, if the conlinent covers an area of 5,200,000 square miles as Fruce and Kreummel sasmme, its mean elevation above sea level is about 6 600 feet with a probable error of ± 560 feet.

if this estimate is approximately cor tions sower to indicate the Antarctic tions appear to indicate, the Antarctic continent is by far the highest mass of land on the globe. By the addition of this huge polar can the mean elevation of the entire land surface of the carts. or the entire land surface of the care
ts increased from 2.12 feet to 2.706 feet.
The process by which Meinardus
reached these conclusions may be
sketched as follows it was already
known that the mean height of the barometer over the northern hemisphere is 08 millimeter higher in January than in July, but that the corresponding baro metric height for the zone extending from equator to 50 degrees south latit is 21 millimeters lower in January than in July Henre, as the entire mass of the almosphere and consequently the surface of the globe remains con signt, the mean barometric height for the zone south of 50 degrees south latitude, which is equal in area to about one-fourth outhern bemisohere. about 36 millimeters greater in January than in July

The observations made by recut exThe observations made by recut exprecision to the control of the control of the conprecision of the control of the control of the conpressure over the some lying between 10 degrees south latitude and the Antancticircle is not greater, but is 0.73 infilimeter less in January than in July This
result increases the January dedict of
pressure and restricts the area in which
it can be made up to the Antanctitican be made in the substance of the conpression January than in July Within
the Antancti. (in it the only observations
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prette continent Meinardus finds the explanation of this puzzling state of affairs in the great atmospheric pressure diminishes as the elevation of the point of observation in reases, and the difference is greater at ion than at high temperatures. Hen in a region where the atmospheric pr sure is constant throughout the year the sea level, it is appreciably higher in summer than in winter at an elevation of several thousand feet. For a given ele vation this difference increases with the difference between the summer and the winter temperature Meinardus | Hann have computed that the mean mospheric temperature of the Antarctic continent is +266 deg F in January (Antarctic midsummer) and -148 deg F in July (Antarctic midwiner) In these conditions it can be calculated that the mean excess of lanuary over July () i millimeters) required for the entire Antarctic zone would be fut nished by a mean elevation of that zone of about 4 400 feet on the assumption of a constant atmospheric pressure at the tie continent have been explored suffi ciently to make it reasonably certain that that continent occupies very approxi-mately, two-thirds of the entire area of the Antaretic sone Hence, on the as sumption of a constant atmospheric pres sure over the remaining third which is covered by water, Meinardus arrives at the conclusion that the average height of the Antarctic continent is about 6,6



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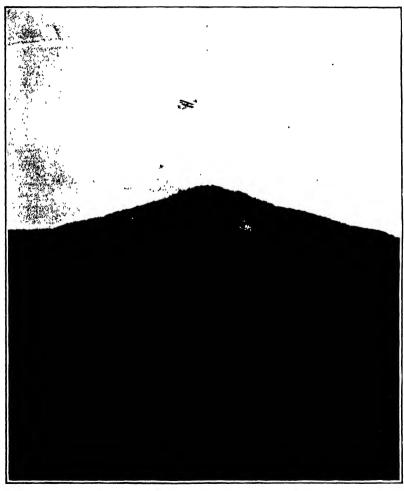
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NEW YORK, SATURDAY, JUNE 11th, 1910

The Rellier is always also to reveirs for examination illustrated articles on sublects of linely interest. If the photographs are sharp, the articles short, and the facts outlantle the contributions will reveive spotal attention. Account articles will be paid for at regular space rates.

THE REW ERA OF ARROWAUTICS IN AMERICA THE REW EXA OF ARROPAUTIOS IR AREXIOA

Is a curious anomaly that, although America
the birthplace of the practical flying machine
a distinction which is universally admitted a
stands in little danger of future disputation stands in little danger of future disputation— the brither development of the art of flying, as first demonstrated by the Wright brothers, has hithered been confined mainly to Furpeas countries. To us, if has always seemed probable that our apathy was more apparent than real and that when suffi-dent stimulus was offered, the art of a visition was sure to come into its own, and its development be cuted with a scal that was worthy of the energy and liberality of the country in which the first practhal flying machine had its hirth.

Evidently the needed spur has been afforded by the phenomenal achievement of Glenn II Curties in mak phenomenal as literament of Glenn II. Curries in making his recent flight from Albany to New York at the imprecedented speed of over fifty miles an hour —a feat which vindicated both the fracighteness and the liberality of the New York World in offering a prize of \$10.000 for such a flight in connection with the recent Hudson Futton fortival

the recent Husson Futton tratters.

Apart from the fact that so garat a distance was covered at so high a speed there are other considers from which largely account for the powerful hold which this flight has taken upon the public imagina tion, such for instance, as the altogether untried na ture of the course the almost complete absence of suitable landing places, and the absolute composure with which, when an emergency landing had to be with which, which an emergency landing has to be made, the strator circled in his path, awooped down, bird like, upon a small open charing above the rocky and bill-covered cilifs landed, started again on the fluid log of his course above the crowded shipping of the North River, and finally came to rest on Gover-nors laland at the very doors of the honse which was built for him during the Hudson Futton aeronautical Here ween man who at the very first tris and over a course which because of the encompassing mountains and ravines and the resulting air currents was believed to be exceptionally difficult accomplished with evident composure and at times with a sugges-tion of complete sang froid a feat of flying which only six months before, was regarded as a dream of the enthusiast

When the news of his accomplishment was finshed When the news of his accomplishment was finished throughout the country its effect was instantaneous and positively electric. The last doubt as to the prac-ticality of long-distance cross-country flying van labed and the evidence of the awakening was shown ost immediate after of over \$100 and is prizes for flights of a similar character, to be held prires for flights of a similar character, to be neist during the present season to various parts of the United States First came the simultaneous and mu-nificent offers of \$25,000 by the New York Times and the Chicago Evening Post for a Chicago-New York shad the Calrego Swelling took for a three-government of a flight of about 800 miles and of the Yew York World and the 81 Louis Peat Dispatch of \$10,000 for a \$1 Louis-New York racu over a 1000-mile course Then the Washington I C Chamber of Commerce and the Area Club of Washington offered \$20,000 for a 225-mile race from Washington to New York as we go to press a \$10,000 prize is being promoted in St Louis for a flight from that city, over a distance of about 250 miles to Kansas City and \$5,000 is offered to Chicago

are the attractive prises that have been made available, within a week of Cartiss's flight, to promote iong-distance feats of the same character. At the same time, through the liberality of Mr Edwin Gonid, as noted elsewhere in this journal, attention is being directed to the mechanical improvement of the sero

plane itself, with a view to enlarging the ability to pane then; with a view to enlarging the ability to remain continuously in the air and extend the dura-tion of its single flights. The offer of the large sum of \$15,000 for the best successful aeroplane provided

of \$15.000 for the best successful aeroplates provided with two motors, one to be ladd in reserve for emergency, is certain to prove a great attimulate to investigate and contrivations, and should result in the production of some very interesting combinations of motive power. This above related of the past week surely justifies the statement that, when the bittery of the art of frying in America comes to be bittery of the art of frying in America comes to be importance to the statement that, when the wind the statement of the second only in the statement of the statement of the second only in the statement of the second only in the statement of Wright brothers were making their flights above the sand hills of North Carolina in the first practical man-carrying and controllable aeroplane propelled by its

THE PERIL OF THE SUBMARINE. UDGED by the number of tragic disasters which

has overtaken the animarine during the past few years, this greatly dreaded instrument of war might seem to be as great a measee to friend as to fee. In the absence of sccurate ination as to how many lives were accounted for by the anhmarine during the Russo-Japanese war, it is a question whether in the last ten years the sub-marine has not caused the death of a greater number of its own crows than it has of the enemy, ar of its own crows than it has of the soemy, and we instant the statement that considerably over half a hundred lives have been sacrificed during the past no years in the ordinary peace maneuvers of submarine vessels. The long roll of disaster is headed, in point of loss of life by the talking of the Fresch vessels "Pluvines" on May 28th last, off Calsis, when 22 miles and me lost their lives The most taial, 28 officers and men just their lives. The most fatal, as it is the most frequent, cause of accident is colliaion We all remember the running down of a Brit lish submarine off Spithead by an outward bound Ori-ont liner which came up from behind unnoticed, and apparently passed entirely over the aubmarine Within the year a similar accident happened at the entrance to the English Channel, when a large ship ran through a floet of submarines at night time sinking one of the boats. To the same cause was due this recent French dissater, the 'Piuviose' being struck by the paddle-wheel of a Calais Dover passenger steamer

as the latter was leaving Caisia harbor

At the same time, although we deplare the terrible loss of life which has occurred, we must not permit these disasters to shake our faith in the utility of the submarine for the accidents have been chargeable to nummrine for the accidents have been chargeable to inefficient handling, or shall we say to tack of suffi-ciently we experience, rather than to any inherent mechanical defects in the design or construction of ciently whe experience, rather than to any inherent mechanic 2 leftects in the design or construction of the submarine itself. In recent years, outside of those due to collision the iones have been charge able, not to theoretical or mechanical defects in the locat themselves, but to carrieomes or incaprehenes in their manipulation. Teatimony to this effect was afforded by the dilary (an amaning document) which the commander of the Japanese submarine, that was recently annic continued to write up to the very hour of his death, in which with characteristic Japanese modifilty he took he historie for the loss of the very lower of the contractions. of his ceasin, in which with constructed Japanese hobbilly he took lie blame for the loss of the vessel directly upon himself. Mechanically apeaking, the highly-developed submarines of to-day as exemptified in the latest types built for our num navy, are thoroughly reliable. The writer speaks from experience having spent some four hours and traveled some twenty miles under the sea last summer off the point twenty mines under the sea and summer on the point of Cape Cod, in the recently completed "Stingray". The vessel descended, ran on an even keel, rose to the surface and was steered, with absolute precision the air within the submarine was perfectly wholesome and free from odor and the composure of the officers and crew betokened a perfect confidence in the sta-

The disaster to the "Piuviose" proclaims the nec The disaster to the "rutions proteins the necessity for that eternal rigilance which is the pledge of safety in travel not merely beneath the sea but in the air and on the dry land. The charge can be no longer made against the submarine that it is "hillid." In the perfected periscope, the vessel is provided with an eye winner vision is as clear as that of the binorn-iars of a commanding officer on the bridge of a war-Furthermore there has been produce now obtainable a periscope which commands a view of the complete horizon during such time as the subor the complete normon during such that as the va-marine is within, say, ten or litteen feet of the sur-face, and with such an instrument, given clear weather and a careful lookout, the danger of being run over by a ship coming up from babind should be completely eliminated. The actions to the "Pipri-cae" seems, however, to have been due to the submarine rising to the surface just ahead of, and in marine rising to the surface just anean or, and in the path of, the Calais steamer Here is a very real and not easily prevented danger. Although the com-manding officer may take a careful survey of adja-cent waters and note the position of other craft before he diven, much is the speed of medicy; vesself that a city may usuity have peased into some yearing ity by the time this submarine riess signle to the sity, face, even though the period of submersion he lim-ited. Collision on rising to the surface is a form of accretant which for the present, at least, must be reconciled as not accretant execution. regarded as not entirely preventable.

Jones ex sons

"MEGNANIPULATR."

"REMEMBERGE TO BE TO THE PROPERTY OF THE PROPE recognized necessity.

recognized necessity.

It is agreeably to this spirit that we inderse
use of the word "mechanipulate" to designate
bandling of a piece of work by a machine. At present time, all the many elaborate and ingenious operations which are performed by mechanical hands and fingers frequently with a close approximation to the delicacy and dexterity of the movements of the the deliracy and destartly of the movements of the buman hand, have to be designated by the word "ma-nipaties"—which is distinctly a minomer. If the work in question could be assipulated with the same facility, dispatch, and economy with which it is mechanipatised, the mechanical operations would never have been introduced. The credit for the sup-cention of this personal way to the product of the pro-cent of the product of the product of the pro-cent of the product of the product of the pro-Restion of this serviceable word is due to Mr Henry A W Wood, and as far as we know, its first use is to be found in his article on "Modern Stereotypy," in the issue of the SCIPATIFIC ANTRICAN SUPPLEMENT of May 14th, in which, speaking of a plate that has been cast he mays "it is left face up in position to be most easily mechanipulated, position to be most easily mechanipulated, mechanism used for the purpose acting with a gentie, uniform motion to position the matrix with accuracy," etc. Then, in a foot note the writer says. "In my experience, I have frequently fett the need of a word which should express the 'handling' of its work by a machine, as the word 'manipulate' expresses the handling of the work of a man by his hands. To fill the gap I have made bold to coin and use the word 'mechanipulate,' which is here employed ' in hring-ing the suggested word to the stiention of the pubspondence columns of the Scharter American

THE COLDEST REGION OF THE ATMOSPHERE

HE decrease in the temperature of the air with increasing altitude—exemplified in the fact increasing attinge—examplined in the fact that the top of a mountain is colder than its base—is a matter of common knowledge. It is a fact that occasional inversions of this distribution of temperature may occur—as when fruit trees in a valley bottom are nipped by a frost that does not touch tha hilltops but it remains true in general, that the temperature of the air decreases up-ward and that the air at great sittindes is extremely cold as compared with that at the surface of the earth

ntil Telescrenc de Bort announced his discovery of the isothermal layer, eight years ago it was not sus-pected that this decrease of temperature did not ex-tend neward to the limits of the atmosphere. Now. however, we know that at a certain attitude, averaging in middle latitudes, about 11.000 meters (miles), the fail in temperature with increasing attitude ceases rather abruptly, anually giving place to a rise of temperature for a certain distance apward, above which the temperature remains approxim constant as far as the highest ascents of sounding balloons have carried thermometric apparatus

Hance, above any given spot on the earth's surface the air is coldest just below the region of the upper inversion, which marks the beginning of the great isothermal layer (or, as it is now called by its dis coverer, the stratosphere).

The aititude of the isothermal layer varies with the The attitude of the invincement layer rates with the heighteric pressure at the earth's surface with the season, and especially with the latitude. It is somewhat less over the poles than over middle latitudes what less over the poles than over middle intitudes and very much present over equatorial regions than anywhere also in the world. In other words, the dream of the present over the present of the world. The other words, the dream of the present o

This was one of many interesting results of the rerams was one of many interesting reserve or to re-markable series of sounding-balloon ascensions abs-cuted in equatorial Africa by the expedition under Beeon and Ellas, sent out by the Royal Observatory of Lindenberg, the complete report of which has just been published by the observatory.

Toron II, Igra

Concreting in proceeding so satisfactority at the Satus locks had in the upper or lake-level tler, which formed the subject of recent illustrations in our column, about one-half of the work is completed. The grand total of excevation done on the canal during April was 2,632,655 onbio yards.

April was Assisted onto yaros. In a recent paper, Ren-Admiral Bacon of the Britisk navy, discussing the probable battleship of the future, arrives at the conclusion that the race between gun and armor, which has been going on for tween gun and armor, which has been going on for over half a century, has been decided, for the moment, in favor of the gun, nor is there any indication of there being a chance of improving the armor and strengthening general construction, so as to render ships reasonably immune from armor-piercing projec-

The fact that the excavation of the Panama Canal through the Culebra range of hills has set in motion a s of 2,000,000 cubic yards of material, which is sliding into the excavation apparently on an inclined sliding into the excavation apparently on an inclined anhatratum of clay, serves to ilinstrate one of the many advantages of the present high level canal over one at sea level. The sea-level cut would have over one at sea ievel The sea-ievel cut would have been carried eightly feet deeper, and the sildes would have been, in all probability enormonaly greater The material will have to be removed, but outside of the additional expense, no ill effects are to be apprehended

The Budson and Manhattan Raliroad Company is to be congratulated on having introduced some all-stee baggage cars for the transportation of baggage between oaggape care for the transportation of nagage occived the several steam railway terminals served by its system. The sides of the cars are provided with roller curtains. There are also folding aprons, which can be let down to bridge the gap between the loading platform and the car. Eight loaded baggage trucks can be wheeled directly into the cars, an arrangement which eliminates much handling and trucking and fa cilitates quick loading and unloading

The has been determined that the sinking of the United States Souther Grydock "Devey" at Olongapa in the Philippines was due to an omission to close the Intake valves. Accidents of this character occasionally occur, and one is reminded of the sinking of the "Toxas" at the Brooklyn navy yard, which happened shortly before the Spanish American war At the time of her tannching, the "Dewey," 500 feet in length and 135 feet in width, was the largest floating drydock in the world She will probably be raised

Asked for his opinion regarding the probabilities of the introduction in the near future of gas engines as a motive power for driving large steamships, Sir Wilia motive power for driving large scenarios, our win-lam Henry White, for many years chief constructor of the British navy, recently stated that in his opin in the difficulty of high temperatures for the pres-ent effectually barred the way if this problem could be mastered as to its mechanical features, it might be possible to utilize gas engines of 20,000 hours-power; hut the proposals to drive battleships with gas en-gines "are so far only schemes."

The plan for opening a central avenue, one h feet wide, between Fifth and Sixth avenues from th to Fifty ninth streets which is being actively favored by Mayor Gaynor, would undoubtedly relieve the congestion on Fifth Avenue, to say nothing of providing the city with a magnificent thoroughfare through one of its most important districts The esti-mated cost of forty million dollars, however, is prohibitive There are other public improvements, such as subways, municipal hulidings, and public schools that are more urgent than this

An estraordinary record was made at target practice recently by the new battleship "South Carolina," of eight 13-inch guns, which has been in commission only three months. Conswaln J R. Edwards, 21 years old who is in his first entistment, made a record with e 18-inch guns in the vessel's No 4 after turret 16 bull's eye target hits out of 16 shots in 4 minutes and 51 seconds. The hits per gun per minute for the whole 13-inch battery were 101, and 55 of 60 12-inch projectiles hit the buil's eye. Furthermore, three of the four turrets on the ship mads 100 per cent of hits.

the four turreds on the hip mad at 90 per cent of his. The advantages of oil over coat were illustrated in a recent try of the "Tale," one of the 32-host per house staneous which run between New York and Bootton The trights were so matthetery that oil will be used exclusively on these ships to the future. Only the complete he was and count for the complete adoption of ones and count for the complete adoption of the ships to plant the 4,4000 gallact to pump lack the highly signate the 4,4000 gallact will be seen to be completed and the ships to the bound trip. The principal market, amounting to 800° at much a force to the plot that dight opinities of the work in the helper count, when seminating the count of t

ELECTRICITY.

ELECTRICITY.

In their tour of the Grast Lakes this month, the members of the Chicago Association of Commerce with be able to keep in telephonic communication with their Chicago offices. Their stammer, the 'Theodorre Concevett,' is fitted with a wiveless telegraph outfit, and also with a telephone system which may be connected with land lines at the docks where the steamer concets with land lines at the docks where the steamer. puts no

The indirect system of illumination, which in casting the light of a jamp against a white surface. such as a ceiling, and having it reflected and diffuse thereby, is rapidly growing in favor. In order to make this system possible with the use of are lamps an improved type of are lamp has been devised by an an improved type of are tamp has been devised by an English cenerar, in which the carbon-feeding mechan iam is placed below the arc. The result is virtually an inverted are lamp, and there is practically no ob-struction to the light passing upward except for the means of auspension from the ceiling

This fall the annual meeting of the Hiuminating Engineering Society is to be held at Johns Hopkins University Arrangements have been made for an exengineering, immediately after the conven six lectures will be given from October 26th to Naveni ber 8th, and facilities are provided for practical d strations and inhoratory work in connection with the subjects taken up It is hoped that these jectures will result in a course of study in this branch of engineering for undergraduate technical schools. It is realized that there is a scarcity of practical illuminating engineers

In Norway and Sanden the question of hydro-electric generation of power has reclared a great deal of atten-tion from the fact that there are so many rivers in those countries capable of such development Contrary, to the custom in this country it is the practice in Sweden to couple generators directly with allow speed turnines One interesting form of turbine generator consists of two whoels, the shaft of one passing through the hollow shaft of the other The wheels turn in opi site directions, and one shaft carries the armature, while the other carries the fields of the generator. This virtually amounts to doubling the speed of the gener-ator or reducing the number of poles. Hydraulic used At Korun are four pairs of turbines on a single shaft developing are rour pairs or turnines on a single shaft developing 420 horse-power The fall is hat six feet and the wheels make but 107 revolutions per minute. At Stangiforden, in Norway, where there is a full of 200 feet, a single wheel is used producing 3 300 horse-nower running at a speed of 300 revolutions per

Mention was recently made of a continued stribe-scope and telephone relay, by which the heart bents of a patient in London could be heard in the Isle of Wight. In a paper read before the liritish Institute of Electrical Engineering, S. G. Brown the inventor a gap of 0 000,000,5 centimeter between platinum elec trodes. The current of a dry cell will flow across this microscopic break, but any elight variations in this microscopic neess, not any eight variations in this distance will vary, greatly, the current passing across the gap The principal difficulty encountered was the question of preserving a gap of such micro-scopic proportions. It was ovidently impossible to scopic proportions. It was evidently impossible to maintain the gap mechanically, but a system has been devised whereby the gap is automatically maintained by the current itself. Despite the dolitacy of the ad justment, the relay may be turned upside down with justment, the relay map of united upone town with out affecting the gap With this relay the fluctua tions in feeble currents may be magnified twenty fold An illustrated description of this relay and stethoscope will be published in next week's issue of the Sonartist AMPRICAN

The wireless telegraph station which has been re-cently erected by the French government on the cently erected by the French government on the Channel coast at Boulogue is of Interest from the fact that it represents the first official application of the Bellini Tool system of directed waves. The new plant at Boulogue is operated by the French Peckal and Telegraph department and is talk out so as to be operated either by the usual method or by the Bellini Tool system. Accordingly the plant has an ordinary vertical antenna and an amported by four-reviews revised antenna and an amported by four-reviews. fron towers 155 feet high placed at the corner of a 260 foot square Four cables connect the tops of the towers, and the Bellini-Tosi antenna consistin the towers, and the Bellink-10ss autenna conventing of two groups of wires, is empended from these Each group is formed of two vartical antenna converging towards the top, each having six parallel wires spaced 12 feet part. These antenna form a triangle with a horizontal section near the ground and two ina mornantas section near toe ground and two in-clined wires. At the top the antenna are 350 feet apart and at the bottom 430 feet. The new skitton is weeking with the French stations of Sainte-Maries, on the Mediterranean coast, and also with the

SCIENCE

Prof. Eduard Friedrich Wilhelm Pfin Prof. Eduard Friedrich Wilhelm Pfueger, who died on March 17th at the age of 81, at the end of over sixty years of single-minded and unawrying devotion student of physiology, was best known to the fic world by the 131 volumes of Phügers scientific Archiv To that mountain publication many a dis-tinguished scientist has contributed Pfüger himself made a special study of the mechanism of spinal action made a special study of the mechanism of spinal action in the frog and the law of reflex action as studied upon the decapitated animal was one of his sartiest investigations. It is work on physiological consump-tion to living organisms has played an important part in our knowledge of the chemical respiration of

During the past three months the United States Wasther Bureau has introduced a simplified form of weather map, known as the 'commercial weather map,' for publication in the daily newspapers, and this now appears regularly in about forty pay. This is an innovation of far reaching importance it gives a much wider circulation to the information contained in the map than it has had heretofore While the matter is still in the experimental stage. It irs altogether probable that the newspaper will ultimately replace the maps now published by Weather Bureau slations throughout the country re suiling in a great saving of expense to the government and the advantage to the public above mentioned

Prof Kronsoher has studied like power of yohim bin to increase the flow of milk of cows and sheep the results prove that the yield of milk is increased during the samulativation of yohimbin, but the in crosso is not sufficient to make an extensive use of yolimbin as a galactogogue commercially profiable in the case of healthy animals. In the case of a cow, whose yield of milk was dininished by an inflamma tion the disease was greatly miligated by the treat uicht, and an increased yield of milk followed. Many similar instances were observed. In no case did any injurious results follow the administration of the No experiments have yet been made on the induction to experiments use yet seen made on the influence of joblimble as a galactopologue in the human species in this case the question of expense is of tess relative importance and the favorable results ob-tained with animals appear to promise a successful

The alloys of Iron with metals other than those which enter late the composition of cast from and steel have been little studied in order to ascertain if any of these altips possess useful electrical proper lies, Burgoss and Anton have made a series of experi ments with alloys of Iron with armeale blamuth, and anilmony The iron which they employed was ob-tained by the electrolysis of very pure Swedish iron The metals were melted together in the electric fur nace in a crucible of magnesia. The alloys were cast into bars which were subjected to various thermal into bars which were subjected to various thermal fratments, and were incredigated for magnetic per meability and hyst reals. The results show that the presence of antimony in Iron always injures the me-chanical strongth of the metal, and sometimes makes Small quantilles of arsenic improve th magnetic properties of from and increase its electrical resistance. Bismuth produces the same effect but it must be added in larger quantities than arsenic

OThe one glows in the Lien cave Sames meaning a the sun enters the sign of Leo, at the sur mer soldier the highest temperature of the year is experienced We may say, on the other hand that the Babylonian astrologers, thousands of years ago placed Babylonian astrologers thomands of years ago placed the king of beauts the fierry and force lous lion in that hart of the zodia, which the sun enters at the sum-mer solutive. The constellation which is called Leo bears very little resemblance to the outline of a lion Probably the name was originally applied only to its principal star, Regulus 11 is to this constellation in the sodiar that we owe the counlies water-gewing floor, heads, which are found in ancient and modern fountains, because in the latter part of July, while the sun is still in the sign lee the Nile is at its highest level Furthermore the liuns nead with bighest level widely open jaws is in itself very suitable for the mouth of a fountain or water spout. This decorative otif was employed universally throughout the tire Roman world Lions heads are found used in this way at Athens Ephesus Olympia Agrigentum, and countless other places. It is not quito certain that this employment of the ilon's head originated in Egypt, Curtius describes an Assyrian has-relief from Egypt, Curtius describes an Assyrian nas-reier from Bairns, showing water streaming from a ring-shaped vessel A lion stands as if on guard on either side of the fountain The water clock, which was need in judicial proceedings, had the form of a lion and a judicial processings, and the form of a non awa as an ame which means the guardian of the stream Hence the idea of protection may have been the origin of the association of lions with fountains, and this outton may have originated in Asia.

THE OCEANOGRAPHIC MUSEUM AT MONACO

BY DR. ALFRED GRADENWITZ

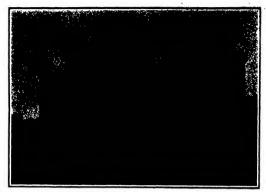
The Prince of Monaco besides being the river of one of the analiset though most charming contribe, note at the end fam. In the world of seleue, has en dowed the principality with a seleutific institute unique in 1st stund, vis, an occanographic masseum festitated to contain not only the cnormous collections rought house from his cowe together of selectivety, but, on realts up acking, everything relating to the investil agation of the sea and its lababilitants, animal and

this museum which was solemnly transpursable soons were songle a situated in a site of surpassing beauty on a precipitous rock dominating the Meditor rareas, close to the framous Ni Meartin Gardenia which will be sometime of the installation of two basement stories, substitution in medically on the installation of two basement stories, which upon immediately on the said for the said for the said for the said for the said for the said for the said for the said for the said for the said for the said for the said for the said for the said said to the said for the said said the more so as some of the pillians start nearly thom, the level of the said.

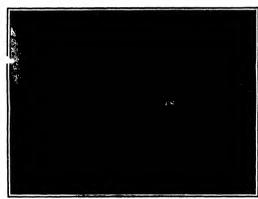
unit, the more so as some of the pillars water bearly from the level of the sea.

The building, 100 meters in length, is of a most imposing superance, and is a manterpiece from an architectural point of view. Each of its emostlish columns & meters in length, is 16 tons in weight Mixt of the motives of devoration are derived from the insuns of the ocean.

When entering the ground floor, we are at first struck by the imposing mosale floor, on which is represented—like who in mosale—the Princeso Alice, the yacht on which the Prince has achieved his most important settnitic cruises. Everywhere ground the hall are seen ornamental subjects representing fishes



The museum of Manage.



Skeletons of whiles, narwhale, and other ocean giants.

and other inhabitants of the ocean. On both sides a monumental staircase leads up to the first floor After passing through a huge glass-paned door, we

After passing through a bugs glasspaned door, we oler a large assembly hall, 7 meters high, adorned with four beautiful columns of Breeda limestone, from the ceiting of which is suspended in the centar an electric luster representing a meduas, whereas each of the four angies is taken up by a smaller luster, forming a gians sphere adorned with long prisms reminding of sea assemones, start makes, and other minding of sea assembles, start makes, and other minding of sea assembles, start makes, and other minding of the search makes and the search

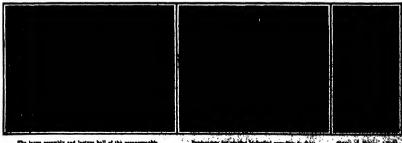
horizon

The western hall is set apart for lectures, con
gresses, and other assemblies, a large part of its back
wail being taken up by an arristic painting represent
ing the 'Princeso Alice on an intensety blue and
somewhat agriated son.

The eastern hall is taken up provisionally by sundry
sociated and a sociaterical subsisters and occanographical

The seater hail is taken up provisionally by sendifyciolections of sooigral subjects and occanagraphical instruments, but is destined particularly for the collections brought home from the Prince's vorgars, which include the rarvet and most beautiful spectures. In fact, the wooderful equipment to be assectived down to a slope of more than 800 meters, while four expeditions in Arctic districts, beroad 80 deg four the second of the contraction of the confour expeditions in Arctic districts, beroad 80 deg four support of the most interesting comparisons with those of the Mediterranean and the Northern Attentic respectively.

Whereas these sooiogical collections are boused in the right hand half of the hall, the exhibits on the (Concluded on page 489)



The large assembly and lecture hall of the ecoanographic museum of Menace.

Company of March Science of March

THE NAM-TI BRIDGE

A REMARKABLE NEW RAILWAY BRIDGE IN SOUTHERN CHINA

(The Tennan Rathway Company is completing the construction of a lite which will controlled the time which will controlled the wind will controlled the wild will be of great importance in developing the commerce of Indefoliate and Tenatin. The construction of this rail way through sole of the most importance of China has been greatly included by the dimension of the provided by the dimension of the provided by the dimension of the state of the controlled by the dimension of consideration of crossing most of the streams by means of stone viaducts was shandoned after a few meantinetory experiments, and it was decided to employ, as five as possible. The Tunnan Railway Com ments, and it was decided to employ, as far as possible, stred bridges, of various types to suit local requirements, and so designed that they could be constructed in parts at the Batignollos works in Paris, forwarded to their des-tingtions its waste has all tinations, largely by rail, as the line advanced, and quick ly put into place The bridge thrown over the Nam Ti River and the peculiar meth ods emuloyed in its construc ods employed in its construc-tion are here described and illustrated. At this point the river flows through a deep gorge between nearly vertical cliffs which the railvertical cliffs which the rail-way pierces by means of two curved tunnels, at a level more than 200 feet above the hed of the stream. The width of the chasm at this level of of the chasm at this level or the railway is about 220 feet. In these conditions the con struction of a simple truss bridge of a single span would have estalled much labor ex pense and delay, owing to the pense and delay, owing to the necessity of working under-ground and of greatly enlarg-ing one of the tunnels in of-der to obtain room for the partial assembling of the heavy and deep trues re-quired. It was desirable, furquired. It was desirable, furnithermore, to besin the contraction of the contraction of the contraction of the contraction of the contraction of the contraction of the contraction of the contraction of the contraction of the contraction of the con
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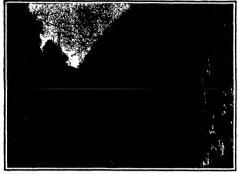
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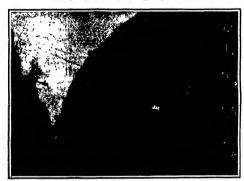
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traction of t on the packs of hailes and men, in parcels not exceed-ing 8 feet in length or 175 pounds in weight. These con-siderations determined the

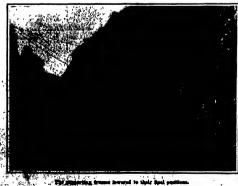
This it wa



Beginning the lowering of the supporting trusces



The supporting trasses lowered half-way.



THE RIVER NAME OF THE PARTY OF

on abutments constructed on on abulinents constructed on artificial ledges on the walls of the gorge about 60 feet below the railway. The distance between these ubut ments is about 180 feet but the total length of the super structure of the bridge

atructure of the bridge is about 220 feet The supporting trasses were shipped from France is parts small and light change to be carried by non and mules, while the upper trusses, the pylone and the joint connecting the support ing trasses were sent out in riveted sections of compart tively great size and weight which could be transported only by ruli as it was de-algued to have the railway eled to the gorge by H time the construction of the supporting trusses would be

The supporting trusses are attached to their phutments attached to their humm its as they are to each uttur by movable joints. They were assembled in nearly vertical positions and their upper ends were subsequently in ered until they met. Each of the supporting trusses is compused of two single triangular trusses when the property is trusses in compused of two single triangular trusses in the property of the property

nianes of which are inclined symmetrically to the vertical at angles of 14 degrees These trusses are about 25 feet dis tant from each other at their tant from each other at their lower and outer ends and about 11 fect at their upper and inner ends "I is straight bottom chord of each slugle truss is composed of two ver-tical plates about 2/5 inch litck and 14 inches deep separated by an interval of 10 inches suitably connected and stiffened by labors or angle plates The lop chord, which forms a broken line is of similar construction int variable section, and is relu variable section, and in rein forced shows by transverse-nistes about 16 inch thick. The truss is completed by pairs of light L-barr, placed normally and abbliquely to the bottom chord. The two larged truss are connected by tross branes in the planter by tross branes in the planter of the normal barr and in the three planes of the bot

tom and top chords
The lower and outer cuit of each single fruss is supor each single trans it was ported on a stone piler by means of a hall-and socket joint of steel. The concave member of the juint is at tached to the truss the convex member is flited to the pler by means of a bed plate and adjusting wedges. The joint is about 6 inches The upper and inner ends of the trusses are connected in hinge joints having place of forged steel, 76 inches in di ameter. These plass are per pendicular to the planes of the single trusses and conse-quently, are not horizontal quently, are not horizontal but the amplitude of oscilla tion is so small that this slight inclination does not in pair the freedom of the

Although the weight of the bridge is sufficient to insure strongest winds, additional resistance is given by steel

bars attached to masonry anchorages and to the rock.

The superstructure of the bridge is composed of two terminal spans 516 feet and 717 feet le two terminal spans 51 6 feet and 717 roce 1ong, and two intermediate spans sub 45 2 feet in length. The trusses have a uniform depth of about 645 feet. The floor beams which connect the top chords of the two single trusses are 18 inches deep and about 1/3 inch.

The most interesting feature of the Nam-Ti bridge is the method by which it was crected Before the various parts of the supporting trusses had reached various parts of the supporting trusces and various to the tunnel nearest the French possessions a windlass was set up over the mouth of each tunnel and the cables of these windlasses were joined together action together that material suspended from the junction could be tarried across the gorge by unwinding one cable and winding up the other

whilding up the other.

The supporting trusses were partly assembled into a few large sections in the tunnels. These sections were then holsted to their proper places in the trusses. were then holsted to their proper places in the fromes with here exceeded as nearly vertical position and supported by the ball and-socket joints at their lower ends and by temporary siags and timbers. The terminal section of the truss, including the socket, was anothered severely to the rock. The outer balves was anohered severely to the rock. The outer balves for the upper intend with the tiles and brows brites in their common planned, which was anohered severely to the rock. The outer balves in the common planned, which he and brows brites in the common planned, which because against the city and the common planned, which because against the city and the common planned with the common planned to the literator of the tunned by two these attached to the literator of the tunned by two clacking storage request to grow the common planned to the com tackles strong enough to prevent it from being dragged forward by the weight and loverage of the remaining forward by the weight and towerage of the remaining parts as they were added, and to mishifain the com-pleted truss in its vertical position. This frame then served as a scatfold for the assemblage of the bottom chords of the truss and their strachments in this position of the truss the bars which are perpendicular to the bottom thords were so nearly harisontal that they formed convenient supports for the few planks on which the workmen stood. After the bottom of the truss had been completed the inner halves of the top chords were assembled in the same manner some of their auxiliary parts being temporarily omitted in or her auxiliary parts being employing the trues. The parts were temporarily joined by means of lathe-turned boils lo order to secure the greatest possible precision, but the construction of the supporting trueses was so far in advance of that of the railway that it was found possible to replace most of the bolts by rivets before the track had been extended to the gorge Meanwhile in order to save lime, a file of coolies, marching five feet apart, carried through the tortuous mountain passes for more than 12 miles, the

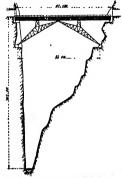
two heavy chains, each 800 feet long, which wore employed in loweriog the supporting trumes to their final positions The other machinery required for this purpose, as well as the sections of the upper table of the upper table or bridge, was brought by

The lowering was ac complished by means of two great pulley blocks, anchored to the face of the cliff above the tunnels and con nected by the two long chains with two simi isr blocks attached to the upper ends of the The chains were first drawn tau In order to slacken the temporary tackles at of the tunnels sud allo their removal The chains were then slowly paid out, by means of windlasses provided with brakes, allowing the two trusses to turn around their outer ends

like the halves of a beanch drawbidge, until their inner ends came to-gather 1n order to facilitate this operation, both trusses carried sights at their inner end, and one of them, which was lowered a little after the other, bore both parts of the hings joints by which the trusses were to be connected. The emitted parts of the trusses were the added, a bed plate was constructed over their junction, and a pytion, which had been partly assembled in frames of two pasts, was structed over the maddle of each truss.

Scientific American

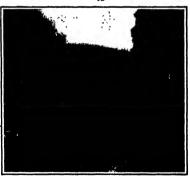
The upper table of the bridge was as mbled, as a continuous trues, in a straight and not very long ex-cavation in the first tunnel. As its construction prossed it was moved forward with the aid of rollers greased it was moved forward with the aid of rollers placed on the two pylons and the junction of the sup-porting trusses until it had been completed and its forward end had reached its abutunent on the oppo-site side of the gorso. The connections between the four spans were then removed. The construction of the bridge was commenced in March, 1908, and was



Side view of the bridge and section of the garge. with dimensions in meters

ompleted to November of the same year -G Bodin,

At the Höganäs coal mines in the south of Sweden, states the Iron and Coal Trades Review experiments staire the Iron and Coal Trades Review experiments have been carried on for some time with the small tag of fine iron ore by means of Swedlah coal. These experiments were at first conducted with a Gredeal furnises naing coal of an inferior quality, for which it was electred find an outsite Later the chief director of the lift has coal mines undertook to conduct



The completed structure; the rails of which are \$81\(\frac{1}{2}\) feet above the river.

THE NAME TO BRIDGE.

the experiments independently, and it appears that he has now obtained favorable results, and that sufficient data have been collected to allow of exact calculations data have been collected to allow of extact assessment and estimates being made. The owners of the HO-ganks coal union—the Billishohm Akrishoha,—have in consequence, resolved to bolid a furnesse with a vasacity of 15,000 tons of fine iron over per assum. When this furness has been departed in predetic with the view of discovering possible fashs, the intention is to even this or other furnesses of the name often and Jank 15, 2005

Become Representation of the State The physical interpretation of the sharages profession in the lines of the solar spectrum, by terrestrial weather conditions shall by passing from one to assoches point of the survivide; it, still under disconsists Whitaker returns the state of the state of the state of the state of the state of the state of the state of spectra proteins concurring in the stormy solar atmosphere, nor does be admit that the peculiarities of sparit spectra are characteristics of sizeras sectors of state of spectra proteins of state of spectra proteins of the state of a coil gas, as is proved by the aurors. Whittaker great fributes the observed changes in the spectrum to pre-pressure. Cortic and Brershed, on the other hand, defend the usual interpretation, which attributes the changes to high temperature, radial velocity and chemical action. Evershed does not admit that pres-sures much greater than atmospheric can carist it bas us, even at the bottom of the revereding layer. This opinion is based upon the sharpness of spectral lines in general But the hypothesis implies that in the sun

in general But the hypothesis implies that in the suc gravitation is everywhere opposed by repulsive forces. Until recently the spectro-hellograph was applied images of the flocenii, those bright clouds of calcium images of the flocenii, those bright clouds of calcum vapor which almost cover the sites of the spots and faculs. Since 1908, following the example of Hale, the red line of hydrogen, which shows entirely differ-ent forms, has also been employed. This has led to the discovery of long dark filaments, which normally persist for several weeks, but which sometimes dis-spear or change rapidly near very active spots. Ac cording to Desiandres these filaments represent torus-does with horizontal sxes. They are exhibited espe-cially by the middle part of the line H a, which corresponds to the upper limit of hydrogen vapor marginal portions of the same line show dark fit

hich are reversals of the calcium flocculi The photographs made by Hale, at Mt Wilson, with this same line, show the spots surrounded by cyclonic structures, which exhibit opposite rotations in the north and south hemispheres. These spirsls are far north and south hemispheres These spirals are interest requested to the south of th for of the spots. These phenomena suggest the circulation of electrified matter in a magnetic field. Ever Islion of electrified matter in a magnetic new keys-shed sought further ordineous by pisking the ailt of the spectroscope across a spot near the sun's limb. In this rase radial valorities in opposite directions should be found on opposite sides of the spot. Instead of this, however, Everbad found numerous and persistent indications of a tangential movement, always directed from the centure of the spot. These results were ob-These results were ob from the center of the spot tained chiefly with the lines of iron

of iron Possibly women movements coexist at different levele, tha whiriwinds in a strategy with the st tum of hydrogen, the centrifugal flow in me-

tallic vapors beneath Secchi, who discov-ered that the dark lines of the solar spectrum become bright or reversed in a narrow atra-tum at the base of the chromosphere during a total eclipse, contended that this reversal could be observed at ordinary times Hale and Adams confirmed his view by photographing reversed spectrum
Their success appears to be due to the very delicate adjustments which enabled them to keep the slit of the spectroscope accurately tangent to the sun's limb. The wave lengths of 184 of the lines were red and were found exactly equal to ose of the corre ing dark lines of the



One of the supporting trus

cal position.

cal position.

perfect agreement could not be expected it, as Julius suggested, the bright lines are due to the light of the photosphere, affected by anomalous disserging.

To blacken light woods make a propersises of an onne of borar, dissolved in a guart of warr, with two owness of shelfer. The layer of the bested until a period solution, the layer of the content of shelfers, dissolved, dies site in the tested until a period solution to displace, dies site in the compositive of groweries, and consipied by religious or displaced to the compositive of properties of the content of the content the layer, which will be shelf the compositive displaced to the content the layer, which will be solved to be solved to the content the layer, which will be solved to be solved to the content to the layer.

Scientific American

Correspondence.

REDUCTION-GRAD TURBING TRATS. To the Editor of the SCIENTIFIC AMER

Your article "A Way Out of the Marine Turbine Hemma," in your issue of the 12th of February places before the general reador throughout the world an epoch-making invantion There can be little doubt as to its great value, and any discussion that h the proof thereof may be welco You refer to the difficulty of ascertaining the actual

horse-power of a turbine as a factor of uncertainty in the calcolation of the efficiency of the combination, at that a reliable theck upon the results given is afforded by computations based on the rise of temperature of the oil But the heat causing this rise of temperature is, at the same time, communicated to the large surrounding masses of metat, and the best thus taken sway from the nil should be calculated, if ossible, or allowed for There is another way less open to question for

There is another way less open to question for measuring the loss of power due to friction. Leight driven shaft be made the driver at 300 revolutions per minute by a reciprocating engine directly coupled thereto, so that the pinion shall be driven. It will then be easy to apply a brake to the pinion shaft, and sacertain the transmitted upon a definite basis of c omparisor with the newer exercised on the other whaft

The results of such a reciprocal test will not merely be "well within reason" but will convince the world They will certainty be most satisfactory, but below an efficiency of 98 % G STRICKLAND

Perth, Western Australia

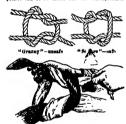
Perth, Western Australia.

To the Editor of the Ernot in Case of Fire.

To the Editor of the Ernot in Case of Fire.

In your issue of May JRth, page 441, is a figure which would be itable in feed to harm if followed in case of fire The right hand upper illustration shows a "granny" knot, which is a loose or slipping knot The one which should be used is the "square' knot, in which the end sud strand both pass below the loop, or both above it, instead of one above and one below The square knot will not slip

E H H... IThere can be no doubt that our corr



THE CORRECT WAY OF TYING

correct. The "granny' knot would be unsafe for the erious use to which it would be subjected in case of ire We therefore publish the foregoing diagram in rder to correct any liability to mistake—Euros] fire

New tometary Theories,
Neither the cometa seen for the first time in 1908,
nor the periodic comets of Perrine and Winnecke
which reappeared nearly in their comments. any special interest Halley's comet responsed in the position calculated by Cowell and Crommelin It with first detected in a photograph made by Wulf, at Helde nru catected in protograph make by worl, at reduce borg, on September 11th but was subsequently found on a piste exposed by Keeling on August 24th its brightness increased abovy nutil the end of the year its spectrum, first observed in December, showed the absorption bands of nitrogen and cyanogen, with indi-cations of self-iuminosity due to incandescent gases

The past year is marked especially by the resolts of the retrospective study of the spectroscopic and direct photographs of Morehouse's comet (1808 Ci, was barely visible to the naked aye axhibited several divergent bright talls accompanied by streamers darker than the sky, as if the space sur-rounding the count were filled with luminous matter rounding the samet were mired with nummons matter Subsequently, the tails beat and evoused, and Melotte observed a diminution of brightness at the point of intersection, as if one tail absorbed the light of the other Several times the tail appeared to break up into knots, which formed new envelopes and moved away from the head with hereasing velocity. Com on of successive photographs showed that the

ture were rotating about a central axis. The stereo-aconic combinations made by Barnard appear to indicate the presence of tatis of helical form, but Barm suggests that this effect may be due to changes of form in the intervals between exposures Crom observes that the apparent rotation of the talls may also be an illusion It is sufficient to suppose that the also be an illustrative in a summission to suppose that the head rotates slowly and projects particles rapidly in a plane which follows the rotation of the tails repre-sent the trajectories of particles, forces emanating m the head and from other points must co-operate with solar attraction and reputsion. The occurrence of four successive outlorests of activity suggests the influence of a medium of variable constitution, formed by particles ejected by the sun and made visible by the passage of comets, either by electrification or by carrying cometary matter with them. This hypothe-sia would expinin the presence of cyanogen and cer-tain other lines in the spectra of nearly all comets On this theory the apparent boundary of a co tail like that of a flame, would be simply the locus of a change of physical state

In the spectrum of this comet, E t' Pickering found six absorption bands corresponding to the principal lines of hydrogen At Meudon and Juvissy a faint con-tinuous spectrum indicating self-luminosity, was ob-served Designers regards the three pairs of bands as doubles, due to the Doppter effect and deduces for the cometary matter a velocity of more than 1,200 miles per second but the presence of a strong single line in addition, leads Campbell and Albrecht to re tect this interpretation

The (urrent Supplement,

A thoughtful yet popularly written article on Hered-ity by Prof W E Castle of Harvard University opens the current Supplement No 1797 The article shows that before any serious attempt can be made to im praye the human race considered as an assemblage of animals possessed of verisin desirable physical and intellectual attributes it is obvious that we must know mething about heredity in general and he ticular each of the desired physical and intallectual attributes is produced in his article he reviews briefly some of the problems which the sindy of hered ity presents and some of the results nitatined from their consideration -- Hir William Crawford concludes manufacture — Sketiac or tac is one of those sids to civilization shout which there has tended to atmosphere of mystery and romance. Mr G Clarke Nugent removes much of this mystery to a strictly scientific account of shellac and the fac industry— A Roce's instructive article on how to build a profits puppet show is concluded—A critical consideration of the Maliet tocomplive in service is published.—The chemical regulation of the processes of the body by means of attrators, kinases, and hormones is dis-cussed by Prof William H tlowell of lubna Hapkins University—Mr William E Stark's paper on Measuring Instruments of Long Ago is encluded—We are very ago to regard the tail of an animal as merely "the very spit in regard the tail of an animal as meroly the other end" in the body but Nature seems to have early esteemed the member highly and in have made it her most efficient instrument of incomption. Many curious facts about these uses of talls are described by Mr James Newton Baskett—Mr W F Denning summuarizes nur knowledge of the planet Moreury— The usual Electrical Notes Engineering Notes Trade Notes will be found in their accustomed p

Wanted: Information About Bishonest Pa

The SCHTTIFE AMERICA's has always made a prac-tice of exposing the sames and devices of the patent promuter as well as the fraudulent patent attorney Atthough the subject is by an accaus new to the re ers of the Survivu AMPRICAN It is one of which all inventors should be thoroughly informed. The Editor of the Eckytork American would like to receive from readers of this journal, letters in which they narrate their personal experiences with dishonest promi and attorneys. Such tetters witt be published in dur course and should not only be of interest in them selves but should sorve as a warning, thereby protecting others against such suares.

Antique Siamese Bronse (Without Bronse Powder)

—ibls is a greenish-black coating, with inlay of green

atina Rub chrome green and zinc white to a greenpattna turpentine oil, mix with varnish and apply to the object, coating the hotlow varinas and apply to the nopect, conting the notion portions especially. If there is rich decoration contains all over and dry. Now rub green cinnabar graphite, and some black pigment to a greenish black color with turpentine oil mix with copal lacquer and coat over all the raised portions traving the bollows untouched, so that the first layer in the bollow porce of copper oxide. tions will have the appearance Glass after drying, with spirit lace

Biodirection in Accessments on the University of Parties
A. Chair of Accessation has been established at the
University of Partie by M. Seell Saharoff, and is coursited by Froft. Marchis, whe has amounced the programme of his course of lectures. The professor besites by respiring to the criticism that M Zaharoff,
endowment would have been employed far more usethilly for the development of our fail navigation if some
direct accouragement had been given to constructors,
who are compelled to make very coulty researches, or
to the brave accessates who risk their lives in these
to the beginning of every industry should now
supermoded by a methodical and rational interpretation of beaverof farts. The object of this lecture tion of observed facts. The object of this lecture course will be to expound as logically as possible the sults which can fairly be considered as certain. results which can fairly be considered as certain. Without entering into very recondite theoretical considerations, the lectures will still be far from "popular" or elementary Finally, the development of the apoctal servountie thrary aiready possessed by the University, and the formation of a collection of small models of aeropianes and dirigible balloons, will supplement the instruction given by the lectures. The

professor will not confine his attention to theoretical speculations and isboratory researches, but will fol-low in dotall the experiments of constructors and the triel lights of aviators, noting in each case the prog-ress schieved and endeavoring to account for the Selectific American Polyce for Inventors

professor will not confine his attention to theoretical

The SCIENTIFIC AMPRICAN offers \$100 in three prizes, to be awarded to the inventor who gives the best account of how he conceived his invention, how he ped it in actual practice, and how he succe in seiting it This sum of \$100 to be distributed as follows \$50 to the best account, \$15 to the second best account, \$15 to the third best account.

best account, \$10 to the third best account. There is no limitation as to subject matter of the invention. In other words, the invention may be a household utensil, a game, a piece of electrical apparatus, an improvement in railway construction, a motal lurgical process, etc. The following conditions, however, must be observed

1 The invention must be patented
2 The inventor must have satually sold his patent, and the invention must have been commercially in-

3 The account of the inventor's success must not be

unger than 800 words.

4 The composition, letter, or article must be typewritten on one side of the paper outy
5 The inventor must sign his offering with a p

donym, and inclose it in a sessed envelope, upon which the pseudonym is written. A second sessed envelope must be provided, bearing on the ontside the pseudonym under which the offering is animitted, and cot taining the resi name and address of the contestant 6 Contestants must address their offerings to Inves

tors' Prize Editor, SCIENTIFIC AMERICAN 361 Broad way. New York city 7 The contest remains open until August 15th, 1910

Judges will select the essays which, in their opinion have wen the three prizes and give them to the Editor have won the three prizes and give them to the Editor of the Schivitric Auvait Av, who will thereupon open the sealed onvelopes containing the true names of the contestants, and notify the winners of the prizes 8 The Editor of the Schivitric Ammaran has the

right to publish the prize winning articles or letters It is

as well as those which may not receive prises
9 Unsuccessful letters cannot be returned. It
therenpon urged that the contestants preserve copi of their contributions

Official Watercological Sum ry, New York, N. Y., May, 1910,

Atmospheric pressure Highest, 50 40; lowest, 39 46, mean, 28 56 Temperature Highest, 50 40; lowest, 39 46, mean, 28 56 Temperature Highest, 51 dats, 34th, mean, 28 56 Temperature Highest, 51 dats, 34th, mean of warment day, mean of maximum for the month, 57 4, mean of maximum for the month, 57 4, mean of maximum for the month, 57 4, mean of minimum, 58,3, absorber mean, 50 2, normal, 55 2, average daily excess compared with mean of 40 years, 95 Warriest mean, 54, in 1852 Absolute maximum and minimum of May for 40 years, 36 and 34 Average daily excess since January 16, 34 Predelpitation 1 65; greated mean, 54, in 1852 Absolute maximum and minimum May for 40 years, 31 56. Accumulated deficiency since January 16, 34 B Greatest precipitation, 910, in 1956, sand, 53, in 1958 Wind. Prevailing direction, northwest, total movement, 311 miles, average boarly vessel, total movement, 311 miles, average hosty, 100 to which 50.1 or more of precipitation consured; 41; Mann relative humidity, 64.5. Desse fog 85, 954. Mean Atmospheric pressure Highest, 80 40; lowest, 29 46 mun remarks auminity, vs.s. Dense log Fin, Fin, Sird, Soth; thupderstorms 9th, 14th, 21st, 20th Mean isotporature of the upring, 53 97, normal, 43.50. Pre-ceptionies of the Spring, 7.08; normal, 10.58.

THE ALBANY-NEW YORK AEROPLANE FLIGHT

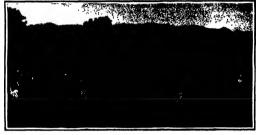
HOW CURTISS COMPETED FOR THE SCIENTIFIC AMERICAN TROPHY AND THE NEW YORK WORLD PRIZE



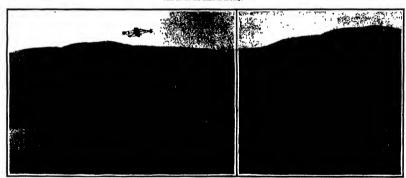
If the three attempts that have been made to ily from New York to Albany, or rare vrea, the first two were made last fail by dirightle ballowan, and were unauccessful, while the third attempt as unade recently by an war ordane, and resulted in a brilliant prisowinning fisht. After making a number of lights over Lake Kesta, at Hammondsport, N. T. and handing seccessfully adhard and took a prospecting trip on the stemather from the capital to the metropolis. He found prescribing the control of the capital to the metropolis. He found prescribing the capital to the metropolis. He found prescribing the capital throughout the entire journey. At Proughkeepies, low-cre, a mile back from the east above, he selected a landing place on the farm of Mr W F. Oill Upon reaching Now York Mr Carting ayes notice that he

would attempt to win the qual prim of the World staff also the Scanwisson Arismonal Trophy for the third also the Scanwisson Arismonal Trophy for the third manner. The third was a second that the assembling of his hiptane. This was accomplished in a test pitched upon Yan Reseasion Indaed, a mile south of the railroad bridge at Albany. A heavy rain caused deay in assembling the hipkane and kept the avator from starting on Thursday, May 86th, while Friday the flight was impossible of encomplishment because of strong ment because of strong with the start was impossible of the south of the start was impossible of the south plant of the start was impossible of the south plant of the start was incomplished as the south plant of the start was the start wa

The New York World, which so generally denated a prize of \$10,000 and united a prize of \$10,000 and united for the performance of this feat during the Hiddens Fotton which it coulded the three within which it coulded the three within which it could be competed for to October 10th, 10th only a few weeks also after the exciting aroutistic zero of Faulhan and White from Jondon to the \$50,000 prizes of the London Daily Mall it was deceded to amend the rules and permit the mask ing of two stops a roots, while the time limit for two stops are not provided to the completion of the trip soon as the incollinations on as the incollinations of the stop of two stops (Dena II.



Just before the start at Albany.

a impossible of accompanies of article ment because of article ment ment because of article was morating Mr. Curties went to the island. Neurythian, was in residiness for the light, and to vestiler appeared to be perfect, but just as the aviator was perfect up, and he was obliged to again posquose shigs attempt. Stunday morning dawned bright on additional ment of the ment of the student of the ment


The biplane passing over loss Island, the government explosives manufactory.

Curties planing down the Hudson at 50 miles as hour.

Curtias, the first witner of the 8s next cup race in of the 8s next cup race in the Fernance lad year of the 18st cut of the 1



The landing of Governor's Library, N. L.
THE ALBERTHAN THE ARBOYCAND PROPERTY.

of 4 or 5 miles an hour velocity He rose quite rapidly to a height of 1,000 fast, and followed the course of the river for Timites to Pumbleogete. As he came in sight of the railway brides at this point, he was fring and the realway brides at this point, he was fring and the collection of about 500 fast. Christians of about 500 fast, and the contract of the contra

becopier pentital with ideas of Programment, and the state of the of Programment, After he initial, disvetver, he was shifting to own for gastine and ell, in order to rejoint the tanks of his plants before continuing the fearner. This necesgitated a stop of one hour at the continuing the partial of the own his eventual right and one his eventual right and

solving out over the river, he handed toward Nav Vark at a somewhat slover galt than before, owing to the curves and wind. During the balance of the fourney, he maintained a height of from 500 to 500 feet. He did not fly as high as during the fart; since, in passing through the Highlands, he found that it was better to fig at a lower sievation. Upon reaching Newburg Mr. Curtles could see from the scole that the wind had changed and was blowing from the west, or directly across his course. As the velocity was not great, however, this did not only

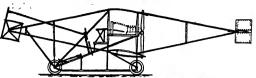
valouity was not great, however, this did not cause him any unesationes.

Soon after passing Storm King, the 1,830-foot mourant hat jots out into the river just above West Point, the daring aviator experienced a sedden down farth of air that caused the meables to be not at the same time, it dipped at a sharp angle to one side, owing to one and catching more of the downward current. With great presumes of mind Mr Curriad current. With great presumes of mind Mr Curriad current. With great presumes of mind Mr Curriad current. With great presumes of mind in a current of the same time, it dipped at a sharp angle to one side, owing to one mod catching more of the downward, in order to gain spood by making a dive and directed his front heritages to become effective, which, of course, they were not when in a current of the section of the sect

possibilities of starting from a cliff
Mr Curties's second stop was occasioned by the discovery that his inbricating oil was aimost gone Br
andfur goom the north end of Mashattan Initadi, by
worked the compilet the field from Albanthon of Torton the compilet the field from Albanthon of Torfore, so as to make sure of vinning the prise,
he made the short defour and landed at 10 25 Å. Mr
one hour and nine minutes after 18 start from Pough
keepsie. The distance covered in this second stage
was, over the course followed, 55% miles, contage of the course followed, 55% miles, contage of the course followed, 55% miles, continuity of the course followed, and second stage
was, over the course followed, 55% miles, confine major that the course followed,
he made the course followed, was covered in gain
that he course followed, was covered in gain
that he course followed, was covered in gain
that he are first that the course of the course of the course of the course
has been dead of the followed of the course of the course of the course
and the shade of the course of the course of the course of the course
and the course of the cour

lased at a hatght of about 15 feet, aircust till be reached the shedt. One of our photographic phore him a plante of the property of the prope

Scientific American



Side elevation of Curtim hiplane, showing relative positions of planes, radders, etc.



The Scientific American Trophy, the first prine over offered for auccessful flights with heavier-than-nir machines.



I hereby make official enter two the Scientific numrican freque, under the rules for JRIO It is my intention to start on a cross country flight from Albang, N. T. on Thereby serving, May 80,3810

I will use a Curtice correlate of the fellowing description bight 900 lbs.; surface area, 500 square fact; motor 50 M P. 8 sylimbor, water couled; lengest then the mentum has been surrected in our flight 50 sparted.

If there are any feet convected with this entry, they will be



Mr. Curties's notice that he would compete for the Scientific American Trophy.

than those that were actually used, which were about 7 finches in dismoter and 7 feet in length in several of the photographs, showing the biplane in flight, these floats can be seen projecting from the back of the lower plane. Together with the plane of the control of the plane of the control of the plane of the control of the plane of the control of the plane of the control of the plane of the control of the same to keen the machine and to keen the machine

from slaking should Mr. Curtiss have been compelled to alight in the Hudson. An ozamination of the machine showed that the oil tank had surpring a leak and had he not had an indicating gage constantly before him he would not have known that his supply was rapidly diminishing, and thus he might have had his motor self.

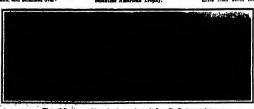
Firman and causes in their seventhers had formorphism made with his lave hiptane was a flett of 38 minutes duration above Lake Keuka at Hammondssort, N. In his try-mits of the machine. The greatest care was taken in re-assembling the machine at Van Remassherd, cotter planed, and covered with varnish, so that they would not work toose Some idea of the strains that must be undergone by a machine in flight can be had when one learns that Mr Curtish hiphane was suit down one forms that Mr Curtish hiphane was suit down out of the strains of the

In making his great flight, Mr. Curtiss also competed for the 8 incrinic Aureman Trophy, which is to be awarded this year for the longest cross-country flight. The first record for 1910 therefore stands at 74½ miles but it is probable that this will be length ened ronsiderably before the end of the year

ence roussourably before the cut of the year.

The average speed made by Mr Curtles from start
to finish of his flight from Albany to Manhattan island
— a distance over the course followed of 128 miles—was
folly miles an hour Including the final leg of 14½
miles from 207th Street and the Hudson litter to

Governors Island (142%) miles this average falls to 4914 miles an hour The sectual air flood falls miles between the starting and falshing points in 1483 miles, so that using this control of the section of the sectio



View of Curtim machine showing pontoons to keep it affect on water-

. THE ALBANY-WAY TORK ARROPLANT PLICET.

An April Tornede.

One of the most remarkable dett s of 'wireless has been made in London possibilities of wifeless has been made in London last month, when Mr Thomas Raymond Phillips a Liverpool engineer, conducted a series of experiments on a small scale with a dirigible balloon entirely manipulated and controlled from the earth tests were made at the Illippodrome one of Landon's tests were made at the improvement of Postdons
the lines of the Zeptelin but only 20 feet long. The model complete weighted about ten pounds and the acrosint was filled with hydrogen

During the demonstration the inventor stood on the stage of the theater while his machine maneuvered board something like that of a typewriter but rathe larger, and in reality composed of a number of push switches, above this was a small transmitter sim to that used in ordinary wireless lelegraphy merciy pressing tin keys Mr Phillips showed that he could make his dirigible do anything he liked the would press a switch over and the machine would prumptly rise, the actuation of another key would produce a descent Forward and backward motion was also obtained with perfect certainly as well as

do niar flights and point to-point soyages which involved very in tricate steering. The experiments lasted some hours but never ones illd the model fall to ild what the invenior had announced it was about to do Tiu most effective demonstration however, was that in with h the ness of such a ma ar of the dirigible had a trap door floor under the control of the operator who after manuscured in the operator who after manuscurering the machine over a certain spot, openal a switch which caused the trapdoor to open and ellowed a number of paper lumin

The mechanism of the invenion is extremely simple and or that could be made perfectly rele in the sar of the ballo are a number of solicrers sulted rent electric wave lengths, and these control sinall switches which put into und throw out of action two sets of propellers the trapdoor, and the system of iamps whereby the sirehin can be lit up when desired. The accumuand lighting the lamps are car ried in the car. The directional control of the airship is effected in a horizontal plane by a pair of propeliers hing out from each add of the car on outriggers similar to those of the 'Reppelin' Either or both of these can be driven, and they can also be reso that the machine can be steered to the right and to the left kept in a siraight course, or reversed back in its own tracks without turning round

Two horizontal propellers con siderably smaller than the driv alderably smaller than the visi-ling screws are also ulisched by materials to the nacelle, and provide the manufacture of the nacelle,

for control in a vertical plane. The machino is so balanced as to be approximately equal in weight to the sir it displaces consequently, when the horizontal ellers are not working it neither rises nor but can be made to ascend or discend by putling their In motion Thus by using one vertical propeller and the horizontal mest the machine can be caused to move he a spiral path, and by cutling out the vertical screw It can be made to rise straight up

The switches whereby the machine is controlled after the wave length of the electricity produced at the transmitter, all the coherer switches on the eir-ship being timed to different wave lengths.

The demonstrations have been so successful that the British War Office have investigated the matter, and it is understood that they have taken the invention up. At any rate tiluls with a full sized machine are shortly to be made and if these are successful the invention will be bought by like government. The dimensions of the full sixed war machine will be 60 feet long and 6 feet in diameter, and it will be capable of carrying nearly a couple of hundredweight of ex-plosives while its radius of action will be well over 100 miles Its speed will be about thirty miles pe

MR. FRANK COULD OFFERS SILORS TO THE

SUCCESSFUL DESIGNER AND DEMONSTRATOR OF A SAFE MEAVIER-THAN-AIR FLYING MA-CHINE EQUIPPED WITH MORE THAN ONE MOTOR AND MORE THAN ONE PROPELLER.

The facaimile letter of Mr Edwin Gould, printed on this page, in which \$15,000 is offered for the best successful heavier-than-air flying machine, driven by more than one motor and one propeller, speaks for it-self. It may be pointed out, however, that Mr Gould, self it may be pointed out, however, that Mr Gould, in offoring his prise, has been moved by other cou-siderations than those involved in a sporting contest. Races, long-distance flights, speed tests, and other record breaking performances, have no doubt dome much to bring the flying machine prominently before the public, but it must be admitted that healdes what ting the natural human appetite for competition and driving home the truth that the flying machine is destined to play an important part in future hums affairs, such contests aid the ert but little

It is Mr Gould's primery intent neutly invention and with that and in view he offers a prize not for the fastest flying machine, but for a

Hopes made of the bun.

The sta cap to sighted with temperature can exist by the possessorie of cannot be theseopes, consequently the amounced discoveries, for annexue; but astronomer are constantly placing their chief reliance on the six instruction results of procise measurements and deligible of the constant of th tended results or precise measurements and deligible and long-continued observations, and they do not accept the physical theories advanced until after a comp time of probation. Even data which have been admitted and used for many years are not exempt from criticism. Thus, the siemests of the suits roution time determined by Carrington fifty years ago, which tion determined by Carrington fifty years age, which are still used in the reduction of the photographs taken daily at the English observatories, have been called into question. Purper has examined the new neuroscuts made by Peters between 1860 and 1887, which lill the gap between Carrington's work and Greenwich photographs. He reaches the surprising conclusion that the sum potes of the morthern and southern hemispheres revolve about two different analysis of the contrast and southern hemispheres revolve about two different states, which make with each other an angle of the northern and treed in the contrast of the

ots has been often discussed and generally rejected In its fevor, however, may be oited the proved fact

that the last maximum in the number of spots which was an-nounced for 1905, was delayed nearly two years, and that this retardation had been predicted by Brown as a consequence of motions of Jupiter and Saturn

The solar activity gradually de-creased in 1909, as had been exrted Nevertheless, a group of ots remained visible from Noer, 1908 to April, 1909 group which appeared in Septem group which appeared in Septem ber 1998, was found to be con-nected with a violent magnetic storm Lockyer's photographs mads with the spectrobellograph, show that the principal spot was gradually chilterated by clouds of alcium which exhibited a cyclonic fore the structure thirty hours be maximum of magnetic disturb-ance Mitchie Smith observed that an extraordinary outhorst of activ ity in the sams spot was quickly followed by violent and prolonged agitation of the magnetic ne This group of spots affected the e magnetism in four su which it produced two disturbances at intervals of five days. This fact suggests the influence of two limited and divergent beams analogous to the doubt

intervals of 27 or 28 days, is well established for magnetic storms and surors: The question has boen asked whether other terres trial phenomena do not eimilarly show the influence of the sun's rotation. From the records of cyclones in the Indian Ocean, Maunder finds that an interval of

Maunder finds that an interval of 28 days is of common occurrence.

The first results of the total eclipse of 1908 have been published. The report of MacCleanz expedition say that the corona exhibited the character, usual at intermediate expects, of great extent in the middle islitteds, that that it was distinguished by certain features from all previously observed coronas. The coronal rays or streamers showed no connection with the protuber-or transmers showed no connection with t



To the Editor.

The Scientific American. New York City.

Deam Stur-

In order to promote progress in aviation, I offer through the Scientific American, a prize of \$15,000, which is to be given to the inventor who designs and demonstrates in this country the best heavier-than-mir flying machine equipped with more than one propeller and with more than one independent motor, in such manner,

that the motors can be operated together or independently.

My objet on offering the prime is to encourage the invention of a heavier-than-air flying machine which will be able to continue in safety on its course, even though one of the driving davices should break down.

In order that the efficiency of the inventions may be thoroughly tested, it will be necessary to subject them to andurance teste of stipulated length of time or distance.

Full conditions governing the sward of the prise will be

announced in a later issue of the Scientific American, Lune Touth

MR. EDWIN GOULD'S OFFER OF A \$15,000 AVIATION PRIES

type of flying machine which has thus far not b constructed. Absolute safety must certainly be at-tained before a flying machine can ever become even n papular vehicle of pleasure, and the attainment of safety is the chief object which Mr Gould has in view The conditions which will govern the novel contest

The conditions which will govern the novel contest which will be inaugurated by Mr Gould's magnificant offer have not been decided upon as yet. They will require deliberation. It is hardly likely that we shall be able to publish them for three or four weeks. In the meanwhile, the Editor will gladly consider any suggestions which the readers of this journal may make so that conditions may be drawn which will be fair and which will best serve the object of the prise.

Klustic energy is the power stored in a moving object which keeps it in motion By way of lijustration. conceive a railwey train rushing along a straight, level stretch of track, the train being driven to its power limit If the source of power, say the steam pressure, is now suddenly removed by closing the throttle, the train will continue to run or "coast," for a long distance, due to its kinetic energy, gradually reducing in speed until the energy is exhausted and the train

The United States during Pebruary produced pig iron at a rate which equaled 31,650,000 gross tons per cunum During January the rate was about 31,000,000 tons, and in December about 31,450,000 tons. In companing on these figures, the Iron Age considers it is questionable whether the February rate will be maintained during March, since the daily onwill be maintained during March, since the daily ou-pointly of olse and antiractic furnaces in tax at the beginning of the month was \$44,854 teas, whereas the daily rate of pidotecies for Perburary was \$5,54 teas. "It is hard to realles," the Journal remarks, "that in Phrusary the production was more than 60 per dent above that of Pebruary of last year, and nearly \$1/5 times title of Pebruary to years age, and yet that so little motal is presenting on the market. It is not surprising that a quadrate in scaled of the fift-ity of the country, to showed pig tyon, \$5 time prepar-ties the property of the production of

DR. ROBERT KOCH, THE FATHER OF PREVENTIVE MEDICINE.

BY JOHN B. HUBER, A.M., M.D.

Dr Robert Koch died on May 27th last. To estimate the value of his work, we must consider how humanity suffered from disease before his time Before the beneficant inoculations of Jenner, ep-

semics of smallpox devastated wast regions, decimating cities and wiping out whole towns and villages. Nearly cities and wiping out whole towns and vilinges. Nearly very wexfare one not was a pock-marked survivor. The dreadful bistory of the imbonic plaques is look in registering to the second survivors. It is not to be a registering of the second survivors of the second survivors. The second survivors of the second survivors of the second time at Best-Shemach, and those 70,000 others were destroyed by the microscopic Best-Size periffs Before and since the Trojan war (in which this garm did its and since the Trojan war (in which this garm did its

and since the Trojan war (in which this germ did its greatest execution), throughout the middle ages, and indeed up to our time, scores of epidemics of the bubonic plague have wrongby ghastly pague have wrongot gnastly havoc One of these, the Black Death of the fourteenth one on tury, destroyed most mis-erably (so Gibbon computed) one-fourth the population of the then known world

Malaria, though not so eath-dealing an agency, has nevertheless dreadfully affect-To cite but the one historic To cite but the one historic distance given by W H I I Jones of Cambridge As is so often the case in history, the conquering Greeks under Alexander were conquered by the India they invaded, and its weapon was one much more potent than the swordit was the microscopic ma-laria plasmodium. Upon its inroads the Greeks began to e much of their is tual vigor and manly

Consider finally tube iosis - consumption - which has probably always afflicted mankind At any rate Hip pocrates twenty two contaries ago, wrote of it as the disease which above all others caused the most suffering and the greatest number of deaths The dreadful infections here somely picturesque in their ravages, have been dwarfed by consumption in the nineteentb century fourteen mil-lions died in war, by hullet and steel and camp diseases, during the same period thir ty millions succumbed to consumption From time immemorial every third or fourth adult—in some comhas succumbed to insidious phthisis We whites have in-troduced this disease among negro "brethren," who die of in greater numbers than it in greater numbers than
we do, and among our Indian
"wards" who are fast disap-pearing by reason of our tu-berenicsis, aided and absteted by our "fire water" Who

has not, either in his family or among his friends, had to endure some experience of the "Great White to endure some apperience of the "Onest White Faguer?" Think of ill Between adolescence and the Strydfit year, in those years when young men and young woman contemplate marriags, when when when young woman contemplate marriags, when when we should be strong to maintain their homes, when we should be strong to maintain their homes, when we should be strong to maintain their homes, when we should be strong to maintain their homes, when we should be strong to maintain their homes, when we have the contribution been distaining every third or fourth of our most produce reserved how the truth the many months and the years of this chronic disease, his family must endure the privations imposed by it, and oftening it sizes themselves become its victims. The world, mercover, has been treasured measurable by reason ra themselves become its victims. The world, merover, has lost treasures immeasurable by reason of epite intellegal seaffice of ones and women of gentles by tuberculosis, "death's direct door to most hard getdents, divines, physicians, philosophers, deep lovers, implies to religion." Tuberculosis has ver boss har as m'est a deventleg booth and concepts has an m'est a deventleg booth and concepts.

factor as it had been a death dealing infection, every year our nation alone has been sustaining by reason of it a monetary loss of more than a thousand millions of dollars

Reflect upon all these things, and then turn the mind to the year of Koch's birth—1843 In that year r entered the university

And let us premise here that in science erest name are landmarks, and the owners of these names have traversed and gleaned in the fields where many a devoted and now forgotten laborer has delved and sown and perhaps eweated blood. It should indeed be sown and perhaps eweated blood. It should indeed be a comfortable observation that in science at least no man works in vain. Full many a one has given his whole life to establishing a fact, or indeed only an

DR. ROBERT KOCK

ttem to a fact, his industry unrecognized, ridicule and even persecution oftentimes his only compensation, ilv-ing perhaps in the pitifulest destitution, yet his life and his works have been absolutely essential to the nniversal scheme There is the human unit, and there is the welfare and the very existence of the race, which latter were impossible without the self shuegat which latter were impossible ing labors of the individual

Nor does it in any wise detract from the gratitude due the great man, that he had profited by the labora of others, adding what he can of his own, scrutinizing every detailed datum in the whole fabric permeating and illuminating it with his own mind, and extracting from the mass the mighty deductions of genius. Thus did Jenner's inoculations, upon the principle of fight Lister and Partenr, upon whose substructure Koch built. These isttor developed the germ theory of dis-case, Eoch made of this theory the acience of bac-teriology, which is to-day the most potent factor in civilination. Pastsur declared it to be within human r to banish all parasitic dis

of the earth, Koch clearly demonstrated how this business was to be gone about.

When Koch was seventeen he persuaded his father

When Koch was sevention no persuaged its into to get him a microscope Pussessed of this most congenial companion, he set about perfecting other technical means of investigation. For even genius cannot work effectively without good tools. After st country doctors in medicine be became a simple country doctor, utilizing the time which-nournful to elate every beginner in practice has a plenty, in elentific study experimentation research, and writ scientific study experimentation research, and writ-ing in those years he laid all the foundation of his future greatness. At that time he was not enrolled in any world-famous institution, nor had he millions at his back Such aids to success are not to he

Buch adds to success are not to be decried, yet it is amazing how frequently genius, burning to gundenthaby in the service of bumankind has man aged to get along without them, how they never avail them, how they never avail at all in the absence of the

But soon the German gov ernment became cognizant of Kochs writings. That gov ernment recognizes good work; it avails itself of abil ity, it engaged Koch in its It 1882 came his truly

It 1882 came hie truly epochal discovery of the tubercle bacilius, the essan tial cause of tuberculosis Here was laid down the sure and scientific basis of the anil tuberculosis propaganda which has since been so suc casfully waging Upon this essures intelligently formu laied and with wonderful result up to our day In Prus sia (Kochs own country) the consumption mortality been reduced forty per cent, in Boston, forty five per cent, in New York city fifty per cent in our northern cities cent in our northern cities twenty per cent in the years of 1901-6 And it is being confidently predicted on the basis of the prophylaxis thus dren-ves, even we in this generation-may see ihis dreadful scourge of the cen turies all bul eliminated from human experience Koch elaborated various tubercu-lins diagnostic of tuberculosis. their curative properties have unfortunately proved disappointing yet they were the basis of the wond rfully effective anti toxins of diphtheria, telanus (the most agentaing of all diseases of which formerly nearly all the sufferers died) meningitis pneumonia, and other dreadful infections

And Kochs archivements
And Kochs archivements
In tuberculosis were only a
part of his service to mankind in 1884 he discovered
the cholera bacilius which is responsible for that
discase in the investigation of other world scourges-(ancer bubonic plague septicamia (hiood poisoning), tr; panosomiasis caitle plaguo, anthrax maiaria— Koch's part has been most vital, elther as discoverer or as originator or developer of prophylaxis and cut tive methods

He showed how malaria could be absolutely van quished by stamping it out of the island of Brien in the Adriatic, under commission of the Austrian government. In Hombay he studied the bubonic plague at first hand. When long past threescore he repaired to a desolate island in Victoria, Nyanza his only white companion being an army surgeon and throughout the whole of eighteen months they together saw but the whole of engineer months into the work out of a single log, was their only means of communication with the mainland. There Koch discovered the croco-dite's blood to form the chief monthshuent of the tactus fly, the blood-sucking insect that transfers the (Concluded on page 480)

The Collection and Preservation of Moths and Butternie

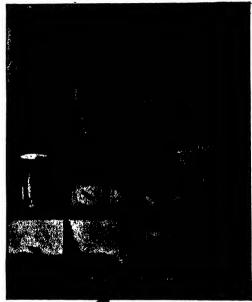
BY FREDERICK M. SCHWERD

The most beautiful main bers of that very large soological class termed in seris ere butterflies and mot be Because of their beauty they have always beauty they have always received more or less at tention from collectors coung and old Many have started to gather these insects, but because of lack of the knowledge of how to preserve them their so-called collections have spoiled, and the specific collections have spoiled, and the specific collections that the specific collections in the specific collections. mens have become broken following words I shall en reliewing words I shall en deavor to describe, with out the use of scientific terms a method in which to preserve their captures, and which gives such pleasing results that the finished isbor will be a source of enjoyment both to the collector and his

The sneetmens must be rne specimens must be caught before being pre-served therefore, it will be most convenient to be gin with a description of the primary requisito for

this work

The Net.—The frame or
rim of the net is easily
made from a piece of iron
or telegraph wire about
forty-two inches long This forty-two inches long This wire is bost in the form of a loop, leaving two straight ends, each about four inches long, in the manner shown in the illustration I. Some sort of rod must then be secured, to serve as a handle. A broom handle answers this purpose very well, but a rod about an inch in diameter and five feet long can be procured at any lumber



t and these. Y chlorefurning an insuct. S. Modici insects. 11. Pashing pin through a systemen, 13, 1 14. Insect between places below to make

COLLECTION AND PRESERVATION OF MOTHS AND BUTTERFLIRE

BERTILLON AND THE BURGLAR'S "JIMMY"

BY JACQUES BOYER

The police officer or magistrate engaged in the enucleation of a crime, endeavors to collect as many exact and the more methodically he seeks werlifes and gives a logical grouping to his cridence, the greater is his chance of discovering the true cause and the perpetrator of the crime M Bertillon, the calsbrated thief of the anthropo-

motric service of the French police, has recently inmotric service of the French police, has revently in-vented a dynamomenter of special character, which will facilitate judicial investigations by furnishing exact measurements of the muscular efforts which are manifested in the violent outry into a house, room, or deak, and by making it possible to reproduce the traces of law work which the burglar has left on doors and articles of furniture The apparatus o and stricted or rurniture The apparatus consense or a steel frame, which is attached by acrows to a wooden table. It contains a lower plate which can more forward and back, two internal uprights stiffsend by curved braces, and a cross piece of steel attached by strong bolts to the tops of these posts. This frame carries (Concludes on page 197)

with staples or wire wound around. (See Fign. 3, 4, and 5) Only the making

and 5) Only the making of the bag running. For this purpose taristan ps-other fine netting of a brown or green color should be used. Mesquito netting is rather course and should not be used, as it scratches the wings

as it scratches the wings of the insects. The bag should be about twenty inches deep and the bot tom rounded as in Fig. 6 It may then be attached to

the rim by means of tape How to Kill the Insect -When the insect is flut tering in the net, the cues

—When the insect is sub-tering in the art, the ques-tion arises how to kill it entire the art of the com-panised by and quickly. This may be accomplished in several wars. Most coil do, which is prepared in the following unsure In to a wide-mosthed giase are placed a few image of cyanide of potassium Up-out these is pour plaster of Parie to the depth of Further to the depth of Further to the depth of Further to the depth of Further to the depth of Further to the depth of Further to the depth of Further to the depth of Further to the depth of Further to the depth of Further to the depth of Further to the depth of Further to the depth of Further to the depth of Further to the depth of further to the things and further to the things and further to the things and further to the things and further to the things and further to the things and further to the things and further to the things and the second of further to the things and the second of the things for the total second of the things and the second further to the things and the second of the things and the further to the things and the second of the things and the further to the things and the second of the things and the further to the things and the second of the things and the further to the things and the second of the things and the further to the things and the second of the things and the second of the things and the second of the things and the second of things and the second of the things and the second of things and the second of the things and the second of the second of things and the second of the second of the things and the second of things and the second of the second of the second of things and the second of the second of the second of the second of things and the second of the s

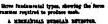
from the net and placed (Continued on page 490.)

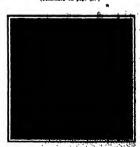


The Sertillon offraction dynamome-ter—a mechanical detective.



Impromions of the three fundamental types, showing the ferce in kilogrammes required to produce each.





446 WATER REATER FOR ELYCHER BOILERS.

MASS WATER STATES TOR ETTERES SALESA. THE TOTAL A STATES A SHARM TO SALESA. THE SALESA such amount as may be required for the time being The heater as illustrated in the vertical section, Fig. 2, and cross section, Fig. 3, consists of a copper coil, in-closed in a casing, with a gas hurner in the center of the coil, and it is connected to the kitchen boiler at the coul, and it is connected to the attenen conter at the top and bottom. The gas burner can be made with or without a primer or lighter it can also be connected with a self-lighter to be operated with a

connected with a satisfighter to be operated with a push betton in the usual way. Take an ordinary thrade copier tube about one inch in diameter, and ill it with like send, closing the ends with stoppers. With a wooden mailer height about 3 inches from such end to fatten the pips, until it is \$1 orch in likitaness. After this, make a wooden centre of the control of the control of the tube in now fastened to this wooden conter and the fast pipe is wound around the same, formular a close helit. The wound around the same, forming a close helix. The other end is then formed over the taparing end of the wooden center by hammering it into place with the wooden center by hammering it into piace with the mailet, until the coils begin to close up, leaving abough space for the spent games to pass out. The end must of course be made straight and in the cen-ter so that it will enter the central hole in the casting

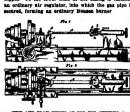
cover which is to be connected to the boiler
After the coil is made into the required shape, the actor the coil is made into the required shape, the stoppers in the ends are removed, and the sand made to run out by turning the coil around and tapping it lightly with the mailet. It may then be connected to a faucet and washed out with water The lower end of the coil may be bent at any angle to suit local

constitutes

The externally threaded end of an ordinary % inch
union is now slipped over the end of the coil which is
peeted over, say about 5/16 inch, forming a fange
which serves to connect the copper tube and iron
pipe with the ordinary union. (See Fig. 4.). This

Scientific American

The burner is made out of an ordinary nipple, with case on each end. In the sizyles are drilled a number of small bole, inside the nipple are a multiper of small bole, inside the nipple as a multiper or cylinder with conical bottom, and provided with a small finange at its upper end, where it is familiar between the end of the sluple and the cap. The object of this cylinder is to partly fill up to inside of the nipple, leaving a small annular space for the gas and air to pass up and out through the small boles after to passe up and out through the small boles in the nipple. To the lower head of the casing is fastened an ordinary air regulator, into which the gas pipe is secured, forming an ordinary Bunsen burn



HIDE AND PLAN VIEWS OF RIG FOR CUTTING A

The main feature of this heater is to introduce the water in a very thin, circular sheet surrounding the central heater it will now be seen that when the gas is lighted the water in the flat cell becomes bot gas in ignose the water in the nat cont occasions not and starts to circulate around the fire up the spiral course to the top of the boiler. The temperature of the water may be regulated by inserting a vaive below the coil, but for ordinary use this is not necessary. Fig. 1 shows the complete beater connected up to a

kitchen boiler with a vent pipe for the spent gas connected to the chimney

Fig. 5 shows how the heater may b Fig. 5 shows how the heater may be fitted up with a primer, or etarter for the gas, which is merely a small independent Bunsen burner, connected below the regular mixing tube. This burner is first lighted, the fame will shoot up into the beater, the ordinary gas-cock is then turned on and the gas ignited, when

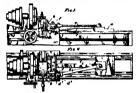
generate in the turned on and the gas ignited, when the pringer may be turned off. This is only a matter of convenience in starting the big burner, as a match of a stary will do the same that the property of the start of the s near, or it may be connected to the water faucet. The apparatus is quite simple, it is only necessary to push a button, which will ignite the gas in the bester, and then open the faucet. The cold water iu the pipe will run out, of course, before the hot water

TURNING CONCAVE AND CONVEX SURFACES.

TURING COURTE AND CONVEX GURLACES.

AT A. A. TERMAND?

Bome time ago the writer had occasion to make a pair of laps for grinding telescope lenses, and as this calls for very accurate work in order to get a true calls for very accurate work in order to get a true urier, it became necessary to make the situachinenia which are bere described. In this class of work it is imperative that the utmost care be given the construc-tion of the several parks, as upon the accuracy of the measurements and nicety of fit depend the quality of the finished product. There must be no lest motion supwhere, as this would mean chatter marks on the



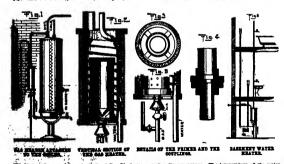
LATER RIGGED TO TURN A CONVEX

surface of the work. For this reason it is better to use taper pins or boils as these will insure a close fitting pion, and the extra trouble will be more close fitting pion, and the extra trouble will be more promuse. It is far better to have it too heavy tinns too light. Nothing is better than a good test from lar, for it is less ago to spring than acted For ratil of it of it is less ago to spring than acted For ratil of its to it is been also beying than some for reality in to 24 inches, a bar % by 1% inchi cross-serious into in one too heavy, while for radii of 24 to is inches % 9 inches is of about the proper propertion.

Figs. 1 and 2 show front and plan views respectively of the concessor enteclinent! The radius line is a labored to make a close fit on the uses of the tall-stock.

spindie, and is provided with a tightening screw b observed that the block is split where the tightening radius bar are now finished on the inside, and tho holes for the pin or bolt d are drilled. Care should be used to get these holes directly in line with the Do used to get these noise directly in into with the dead centre, it may appear that a slight variation one way or the other may be of no account, but it is a good mee hank always adheres to the rule "Anything word" doing at all is worth doing well. The block of its secured in any suitable manner to the took post alide. At this part of various makes of lathest different to the control of the c it is impossible to give a form of block to fit ell but it is impossible to give a form of block to fit ell but any good mechanic can devise means for securing one to his lattle. Regarding the radius bar: filter can be add except the spacing of the holes. Do the eccuracy of the curve of the part machined Fig. 2 shows the tool on a line with the center, Tho that stock a show at the tool on a starting to cut. The tall stock has excluded in position it is set before starting to cut. The tall stock is now changed in position. tion, while the lathe carriage should be free to move back and forth on the ways. As the tool post slide is back and forth on the ways. As the tool post side is drawn toward like operator the carriage will be drawn back, causing the cutting tool to describe an arc the radius of which is equal to the distance between the centers of the holes in the radius bar. The tool is fid to the work by turning the hend wheel of the tail stock screw while the cross feed is accomplished in

the usual manner Figs 3 and 1 represent the device for turning consurfaces, which is somewhat more complicated then the mechanism described above. The radius bar used for concave work can be used here but all of the uther parts must be made especially for the purpose. The block a must be planed and fitted to the inner ways of the lathe and mounted in such a manner that it can move freely backward and forward. The slide d which carries the cross-silds block d' is securely boited to the lathe bed Boited to the sliding block d' is the to the latbe bed Bolied to the sliding block of is the bearing of to which is severed the forward end of radius star or. On the upper side of block of is a roller which runs in the slot in block of the latter being secured to the tool post carriage. The latter carriage and block as arrightly connected by means of the and block as registrally required to the hridge who as above by the dotted lines. The opportunis is es, bearing in mind that side d is rigidly as follo secured to the bed As the tool post side or cross side is fed forward, the siding block dt is carried with it hy means of the slotted block b and roller f. As slid-ing block d' advances carrying with it the forward end of radius bar c, it becomes apparent that block a must move backward, and as this block and lathe carriage are rigidly connected by bar c the lathe carriage will be carried with it, the result being that the tool is caused to move in a reversed arc. It might be well



tions at which and of the coll. Of course of the simple should be put us before the faculty of the coll with the coll when the put is now in label yield casting a glory of Scholl where it, Japan of an absolute between the coll and net up interest to the cost. The seed to now the gift is the cost of the now the gift is the cost of t

make its appearance. The temperature of the water can be regulated by the facet. That is to say, the present the host desired, the smaller should so the quantity allowed to run through the facet, and side serves. When no more hot when it wanted the other botton is pushed, which cuts off the gas and puts out the first the beater, and the facet is closed the side of the present the side of

to state that in order to avoid resetting, it is a go to state that in order to avoid resetting, it is a good plan to have the hlank which is to be machined cast with a convex fare of about the same curve as it should be when finished if this is not done or we wish to use flat disks of cold-rolled sizes or other metal it will be necessary to move the cutting tool

A SAFETY OIL CAN

When oiling electrical machinery, it is elways advisable to safeguard yourself against accidental shock copy fally when currents of high tension are being



OIL CAN WITH INSULATED THE

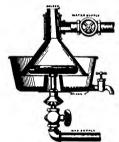
generated It frequently happens who generated It frequently inspons when an ordinary insponse when that a sovere shock is received by the other, resulting sometimes in deeth Several years ago the writer in vested an oil can lard as was perfectly asks nader all votted an oil can lard was perfectly asks nader all ordinary conditions of use Osing to the extremo simplifity of the design any one possessing ordinary mechanical suitivity can (convert an ordinary oiler mechanical suitivity can (convert an ordinary oiler either of the verticel or borizontal kind, into a safety Cut the spoul in the middle and solder upon oner Cut the spice of krass tubing having either enex-ternal or iniernal thread cut. Fit thereon a coupling sieeve made of insulating material as shown in the sectional between the The insulator can be made out of either herd rubber or vulcanized fiber turned in the other nerd rubber of vulcanized note turned in the inthe, with a milled center to admit of a firm grip when serewing or unserowing the parts. Since oil is an inaulator, no current can get past the coupling sienve to the oiler's hand

INSTANTANEOUS WATER HEATER.

The old proverb, 'A wetched kettle never bolls," does not apply to the water healer shown in the accompanying litustration because hot or even boiling water on be drawn from it, the Instant it is put into opera-on. It is made from an ordinary copper funnel and Hon cake tin

The copper funnel should preferably be tinued on the outside To the water supply pipe is attached a valve for the regulation of the flow of water To this veive is fitted a short nipple and an ordinary toe fit-ting. One end of the arm of the tee is fitted with an ordinary ping which is bured and reamed out to fit the small end of the funnel and the end of same is inrned over with a small hammer and soldered to the plug The other end of the tee is filed to fit very closely to the outside of the funnel, leaving, however, u slight annular opening which may be regulated by is turned on it will flow in an even thin sheet over the funnel

incide the funnel is an ordinary was burner, anch



HOME-WADE INSTANTANCOUS WATER HEATER.

as may be purchased for ten cents. This hurner is connected to the gas supply in the usual manner it will be noticed by referring to the illustration that the funnel is in an inverted position. The lower part of the funnel is surrounded by en ordinary cake me or me tunes is surrounced by an orimary case movement, with the inside cone partly out off. This in forms a basin for the hot water which may be drawn off with an ordinary fauest soldered to the cake tin, or it may be run off as the water heats. It will now be seen

that when the gas is lighted the funnal becat once, and when the water is turned on it is to through the narrow opening between the tee and the funnel in a naiform thin sheet which spreads over the funnel in a naiform this about which spreads over the funnel and bocomes hot as it flows down. Almost any degree of heat may be obtained by requisiting the flow of water with the valve. The spent gause from the gas hurner pass up through the funnel and out to the atmosphere. Some arrangement may be made to con-nect the water and gas valves so that they will be turned on simultaneously, thus obviating the danger of overheating the funnal

STRAM BOXES FOR BOAT BUILDING. BY A, P RES

A eimpic method of rigging a steam box for boat work is as follows Take a common wash boiler, put work is a tolows "ake a common wash fooler, put a 1% inch hole in the cover to receive a short plece of tahing 2 or 3 inches long, which should be soldered. The stamn box is made of wood, of any length desired, and about 10 inches high by 8 inches wide inside Make a couple of hockes hollowed out to fit the top of boiler cover, and nail them to the box. Out a round



STRAM BOX CONNECTED TO A WASH BOILER.

hole in the bottom of the bex to receive the tahi that has been placed in the cover of the botter Be careful not to allow the tuhing to project inside the careful not to allow the thing to project inside the box. The ends of the box are generally stopped up with old rags. In operation put about a paifful of water in the boiler at the cover on, and then lift the



STRAM BOX COMPRCTED TO A CAST-IRON MUTTLER.

steam box and place it on top of the cover, allowing the tubing to enter the bottom of the box Another method of constructing a steam box has

Another method of constructing a steam how has been devised by William Ells, a beat halled: It is made by taking a cast iron muffer, plugging the lower end, and connecting a short length of 1½, inch pips to the opposite end A tee is put on the end of the pip with a short pless of 1½ inch pips served into the tee at right angies to the number pless. The upper and of the tee is plugged up with a wooden plug, if there is no reducer handy

Bore a hole in the wooden plug, and server into it a short pleve of % inch plue, fitted with a stop cock of some sort. Above the stop cock, place a can be of some sort. Above the stop cock, place a can be simply boring a hole in the bottom and servering to simply boring a hole in the bottom and servering to the short inleps above the stop cock. In operation, the muffer is placed in the store with a coal or woold for. A plece of sheet from with a boat brought which the plue projects, serves as a corer for the store, where is poursed into the plant poil; and allowed to run down into the muffer as desired. A wooden stam bor mounted on legs is connected to the muffler by the 1½ inch plue. This style of boiler is not injured it boils oft, and is frequently red holv when the water is put in This, of course, makes it "fashty," but otherwise no harm is doos, as the pipes to of sufficient size to handle all the steam that is generated. Bore a hole in the wooden plus, and acrew into it a

Hartine West's scorts us near a began, A best disht in more appeared it ensures attaches of the elements this say speter spat of the boot. The smashine may, he drying it up half the thus, while smashine may, he drying it up half the thus, while during the other half, it may be covered with reis, dew, or sait water. And out this account the majority of both brilliers out the season, which down not make



MARING TIGHT JOINTS IN BOAT BROKE

as pretty a deck as a tight seam, made in the following

manner. Have the wood thoroughly seasoned and make a nice fitting joint for the deek plank that you are laying next to the plank sheer. Whan this is done, take the place out and with a smooth steel rod or hurnisher of some kind, burnish down, with quite a of the accompanying drawing. This of course compresses the wood Now plane the wood down on the jointed edge, making a true corner again This is now ready to fasten on the deck carlins Proceed in like ready to fasten on the deck earlies Proceed in like manner with the rest of the deck planks. The joints on a wooden tank or vut can be made tight by the same principle. Instead of brainshing the corner a round red is laid in the center of the jointed piece and with a hammer is forced nearly half its diameter in the wood (86e Fig 3). This is planed down until there is no groove left, each joint is treated in the same way. When the wood is meistened, the part that has been compressed by the round red will expand This produces a very tight joint.

TO PREVENT OBSTRUCTION OF THE PERD PIPE IN AUTOMO

Among the worst and most costly troubles of the amateur motories are those connected with the piston, and if he is unable to discover the cause of the discover the cause of the discover the cause of the discover the cause of the discover the cause of the discover the cause of the discover the cause of the discover the cause of the discover the cause of the discover the cause of the discover the cause of the cause of the discover the discover the cause of the discover the cause of the discover the cause of the discover the discov eimple precaution

simple precaution
Recently whon my engine failed to work properly I
determined to look into the matter myself, and started
by removing the cylinder heads I discovered amail
particles of metal around the edge of the cylinders and the cylinders themselves were scratched up. Trac-ing this to its cause I discovered that the feed pipe was elmost clogged up with small particles of corroded was sinuct clogged up with small particles of corroded copper Going krither, ny gasoline tank showed signs of corrosion which is attribute to poor gasoline, con-taining considerable mostature thereby causing corro-sion of the copper tank. After giving my tank a thor-coph washing and scraping I shad it electropiated inside with a coating of the All particles of metal were re-moved from the cylinders, the feed pipe was cleaned out, and the parts were connected up I have been trunning any morter for the past sight mentits without ble recurring, and have saved myself the a new tank

HOW TO DRILL A HOLE CENTRAL IN A BAR.

It is a rather difficult matter to drill a hole in a bar and keep the hole central. The accompanying drawing shows a practical kink. A piece of tool steel



METHOD OF REILLING A MOLE CRUTEAL IN A SAR.

A is caught in the lathe chuck, and is turned and bored so the hole will run true with the settide disas-sier. The outside diamater is turned the enter set of bar 3, which is to be drilled. The bar 3 is placed in a view as shown, the drill get at placeds to po or the job, and the view is then tightened up, also the fig and the bar are of the same diagestor. Our place will held them both very rigidly white the her is 30-ters bound.

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parts of the stocked converted to the state of the state

persons.
THINTHIA ROWN - P. SCHARFER. Oskiand,
Cai. This invention relates to certain improvements in tooth crowns, and more particularly to certain improvements in the manufacture of the pattern or model in intuition of which the gold crown is cast. The tooth crown conforms perfectly to the tooth as an annuals land for fitting around the tooth powers it field desired contour and is all formed of a taigle casting.

HANK NOTH CUTTING If & HOER, Han-over, Pa The purpose of this inventor is to provide a cultur with a pinratity of hisdes, which will hold a sheet of notes in position to be cut when the handle is operated, the frame of the cutter helm open so that the notes fall therethrough when cutting

Meaning and Lighting.

VAPOR BURKER—A H. WATE, M. Fass, III. This invention is an improvement in vapor survey of the Canacter desioned in Letters between the Canacter desioned in Letters between the Canacter desioned to get the responsing barner and directly above the exponenting barner and directly above the remove of this barner, each pine baring an executed to the story. These at their opposite media are connected to a common phy, which passes through an air day, and discharge at the control of the story. These at their opposite media are connected to a common phy, which passes through an air day, and discharge at the control of the story of the control of the story of the control of the story of the control of th

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PATENTS

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#### THE MUSEUM AT MONAGO.

(Concluded from page 476.) left contain everytaing reating to physical occanography, that is, the physical investigation of the sea, com-prising all kinds of instruments, such as sounding devices with samples of the sea bottom, bottles intended for taking sea bottom, bottles intended for taking water samples and recording the temperature at a given depth, apparatus for inswellanting son currents and the density of sea wrater, instruments for studying the post-rection of light into the depth of the comma, laboratory installations for the physical and chemical sandysis of sea water and sediments, as many season of shousests contained in wear seasons of shousests contained in wear

collection of siements contained in sea water, sit.

All these variegated exhibits have been provided with labels in the three principal languages (Freed), English, and German) which greatly add to their utility and enhance their inter-national character.

national character.
The first story, which is situated at 64 maters above the sea, likewise contains a large hall, in the center of which is saidhilded one of the Prince's whele-books with the whole of its equipment. On the walls are arranged air comprehensive collections of photographs relating to the voyages of discovery organised by the Prince, and all tinds of other commongraphic subjects. To the right of the services done is not set on the components of the prince of the services of the contract of the contract of the services of the contract of the services of the services of the services of the services of the services of the services of the services of the services of the services of the services of the services of the services of the services of the services of the services of the services of the services of the services of the services of the services of the services of the services of the services of the services of the services of the services of the services of the services of the services of the services of the services of the services of the services of the services of the services of the services of the services of the services of the services of the services of the services of the services of the services of the services of the services of the services of the services of the services of the services of the services of the services of the services of the services of the services of the services of the services of the services of the services of the services of the services of the services of the services of the services of the services of the services of the services of the services of the services of the services of the services of the services of the services of the services of the services of the services of the services of the services of the services of the services of the services of the services of the services of the services of the services of the services of the services of the services of the services of the services of the services of the services of the services of the services of t ised by the Frince, and all kinds of other are represented ancient. Greek models commongraphs subjects. To the right of with pictures of fishes, orahs, and dolph the entrance door is located a switch lips as well as Japanese emerating, based for the absorber lighting. The Web which show an admirable treatment of halls adjusting the central hall are like-fishes. From indepressing the central hall are like-fishes. From indepressing the central hall are like-fishes and the second of the second hall and the second hall are represented by the second hall are represented by the second hall are represented by the second hall are the second hall are represented by the second hall are the second hall are the second hall are represented by the second hall are the second hall are the second hall are the second hall are the second hall are the second hall are the second hall are the second hall are the second hall are the second hall are the second hall are the second hall are the second hall are the second hall are the second hall are the second hall are the second hall are the second hall are the second hall are the second hall are the second hall are the second hall are the second hall are the second hall are the second hall are the second hall are the second hall are the second hall are the second hall are the second hall are the second hall are the second hall are the second hall are the second hall are the second hall are the second hall are the second hall are the second hall are the second hall are the second hall are the second hall are the second hall are the second hall are the second hall are the second hall are the second hall are the second hall are the second hall are the second hall are the second hall are the second hall are the second hall are the second hall are the second hall are the second hall are the second hall are the second hall are the second hall are the second hall are the second hall are the second hall are the second hall are the second hall are the second hall are the second hall are the se

sea are on exhibit either in a fresh con dition or as preserve; and even such ma terials as fish oil, guano meal, etc., are

represented
Another subject of great interest, and
which will have to be further developed,
comprises all kinds of fishing instruments (boats, nots, etc.), either in the ments (toata, nots, etc.), either in the natural size or in the shape of displass the models. Many scientists and this Prince himself have designed special mechanical catching outsits for deep-sex stating, while solver instruments had to exopical plankton of the surface, inter-mediary zeroes and see hottom, as well as for catching occan animals of espe-cially large size. All these tensified tunnish are indepensable for obtaining an adequate knowledge of the customs, animals, and apart from their scientific therese, are of much practical utility by interest, are of much practical utility by enabling suitable means of protection to be ascertained in the case of organisms lending themselves for industrial utili

In the same half is found a repr ative collection of art subjects, imitating the wonderful and most variegated forms of marins organisms. Besides the most or marine organisms. Besides the most modern productions in this connection are represented ancient Greek models with pictures of fishes, crabs, and dolph jus as well as Japanese engravings, which show an admirable treatment of



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to chemistry, ocean physics, physiciogy, to chemistry, ocean physics, physiology, etc, whereas the four remaining are set apart for zoological, botanical, histolog real, etc, investigations A large photographical inhoratory is installed at the castorn and of this story in the lower basement story is found a workshop destined for different kinds of rough work, especially the mountain, such as large fishes,

or big annuals, such as large mass, whales, scals, etc. The numerous appa ratus installed therein are operated by a gas motor. A special room is reserved for the dressing of fish and whale skele

Two rows of aquaria are installed in the eastern wing of this underground story An enormous iron-concrete table 21 40 meters in length, and 0 87 meter in width, parallel to the first row of aquaria (between the latter and the win aquaria (between the latter and the win down) is destined to receive a large number of transportable aquarium tanks of various sizes, the overflow from which is discharged direct on the table, the lat-ter being so inclined that the whole of the water is collected in a central trough These excellently listhed research aquaria, will allow of a multitude of aquaria will allow of a multitude of physical and biological researches in the field of oceanography in the small aquarium basins can be investigated those smaller size animals which, being these smaller size animals which, being total in the large squarfa, have to be con weniently isolated in conditions corresponding to their particular mode of life. The sea water, derived from a rocky soot where owing to the continual whirl pool it is always fresh and well acreated, is thrown by two electric pumps to identerus height. From the receiving tank is thrown by two electric pumps to identerus height. From the receiving tank of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the general public, but a

ure to find an equipment more compresensive than anywhere size in the world The Seine at Paris runs betw stone walls in a channel that is spanned by many bridges. The width of this channel may be seen by noting that the

not only an institute intended for the instruction of the general public, but a center of scientific investigation where students of oceanography will always be

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Inquiry Ve 9131. Wanted manufacturers of cut testible for fancy work sofs piliows, etc. and oil culous and breatest for same. and prissive for same.

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I punity No. 9162. - Wasted, addresses of shirt nakery in Maskettan, who will make a tew shirts of Inquiry No. 9163.- Wested, marety Inquiry No. 9164, -Wanted manufacturers of a vacuum pump that will exhaust from \$6 to 400 s b. inches of air per stroke and built as legits as prosable. Inquiry No. 9165. Wanted, remot and addressed of parties herist deceases of evicent siles sand, or Imply No BORG. Wanted the address of parties

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(Concluded from page 483.)
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use of the sleeping sickness, and there Koch elaborated most important prophy-lactic and curative measures against this most melancholy disease.

this most melancholy disease.

This faithful servant of his race never rested. Coming from Africa, he took part in the International Congress at Washington, observing then "I wish to evote myself for several years to come further investigations of these pro

devote myself for several years to come, to further investigations of these prob-lems—and this is his sixty-fifth year. Thus Kochis sojourn assume that the properties of the properties of the properties of the properties of the properties of the process of the genius), by the rational use of our facul-ties, and by realizing that we ourselves are coefficients in the working out of our own destinies, it is indeed within our power to be rid of those infections

THE COLLECTION OF SETTEMPLAND.

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the pain when the insect is cean, it is placed in a paper envelope made in the manner shown in 10 Some of the large moths have greasy bodies, and will, therefore, have to be degressed. This may be done by placing the envelopes containing the insects in gasoline for twenty four hours or more

Byreading the Insects—If on reaching home there is time to apread the inserts caught during the day they should be taken out of the papers end treated in taken out of the papers and treated in the following way. For use in appread-ing, a perfectly flat board with an abso-lutely amooth surface, some insect pins, some pieces of plate glass of different alsos, and a faw needles stuck into match sticks are needed. The insect is taken between the thumb and the index fanger, and an insect pin is pushed through the between the Limmb and the index finger, and an insect pin is pushed through the thorax, as demonstrated in 11 With a broad-tipped tweezers, which may be pur-chased at any instrument maker's for a small sum the wings are taken hold of small sum the wings are taken hold of where they join the body, and are gently bent open until they remain in a horizon-tal position. Then the insect is placed upon the board and the pln is pushed in. Now a pin is inserted behind the heavy vein, and the wing is gently drawn forwith, and the wing is gently drawn for-ward until its base is prependicular to the body. The pin is pushed into the wood This operation is repeated with the other wings, and stripe of giase are placed to them to prese them fair. The placed them to prese them fair. The placed them to prese them fair. The thought is now gardly extracted. While thorax is now gardly extracted. While the pin is bleng withdrawn, he pieces of giase sheetid be held with the taumh and the first flame of one hand. The in-seds are laft on this hourd for a weak while the pin the pin the pin the pin while the pin the pin the pin the pin while the pin the pin the pin the pin while the pin the pin the pin the pin the pin the pin the pin the pin the pin the pin the pin the pin the pin the pin the pin the pin the pin the pin the pin the pin the pin the pin the pin the pin the pin the pin the pin the pin the pin the pin the pin the pin the pin the pin the pin the pin the pin the pin the pin the pin the pin the pin the pin the pin the pin the pin the pin the pin the pin the pin the pin the pin the pin the pin the pin the pin the pin the pin the pin the pin the pin the pin the pin the pin the pin the pin the pin the pin the pin the pin the pin the pin the pin the pin the pin the pin the pin the pin the pin the pin the pin the pin the pin the pin the pin the pin the pin the pin the pin the pin the pin the pin the pin the pin the pin the pin the pin the pin the pin the pin the pin the pin the pin the pin the pin the pin the pin the pin the pin the pin the pin the pin the pin the pin the pin the pin the pin the pin the pin the pin the pin the pin the pin the pin the pin the pin the pin the pin the pin the pin the pin the pin the pin the pin the pin the pin the pin the pin the pin the pin the pin the pin the pin the pin the pin the pin the pin the pin the pin the pin the pin the pin the pin the pin the pin the pin the pin the pin the pin the pin the pin the pin the pin the pin the pin the pin the pin the pin the pin the pin the pin the pin the pin t

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(Opnomised from page 400.)-Bases self for any leagth of time thrus-triangular papers, they must first be re-leased or softened. This may be done by placing them over hight between moist cloths in a box, adding a few drops of carboilo acid to prevent mildew. They should then be spread in the manner.

ating.—The last step in the pres recomming—The last stop in the preservation of the insects is the mounting.

There are various ways in which this may be done, but the writer knows of none better than that invented by Denton. Brothers of Wellesley, Mass Cases of glass are made, varying in size with the Cases of size of the insect to be inclosed. These cases permit of a clear view of both the upper and under side of the specimen, upper and under side of the specimen, as the top and bottom are made of glass. The insect is supported by its wings on a glass shelf (15) When the insect is placed in position, the top which is placed in position, the top which is himped at one edge a closed over it and is easied with the passe-parton binding it which forms the sides of the box 80 stmple is this method of mounting, that The mounts can be obtained at prices ranging from five cents up Thee results the mounts can be obtained at prices an other mount with which good results can be obtained. He Riter insect mount. These mounts consist of a next cardboard has been a place to the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract These mounts consist of a peat cardboard box having a glass top cover and filled with fine cotton batting, in which the in sect is readily embedded. The glass cover when closed holds the insect in place. The only objection to these mounts in that both sides of the insect are not visi the poin sides of the insect are not visible, and therefore two specimens will have to be mounted to show both the upper and under sides. Riker mounts may per and under sides. Riker mounts may be obtained from all instrument makers having a natural history department Collection of Specimens -- Now that the

simple served the south. We will dood you take the supplementation of the supplementation of the supplementation of the supplementation of the supplementation of the supplementation of the supplementation of the supplementation of the supplementation of the supplementation of the supplementation of the supplementation of the supplementation of the supplementation of the supplementation of the supplementation of the supplementation of the supplementation of the supplementation of the supplementation of the supplementation of the supplementation of the supplementation of the supplementation of the supplementation of the supplementation of the supplementation of the supplementation of the supplementation of the supplementation of the supplementation of the supplementation of the supplementation of the supplementation of the supplementation of the supplementation of the supplementation of the supplementation of the supplementation of the supplementation of the supplementation of the supplementation of the supplementation of the supplementation of the supplementation of the supplementation of the supplementation of the supplementation of the supplementation of the supplementation of the supplementation of the supplementation of the supplementation of the supplementation of the supplementation of the supplementation of the supplementation of the supplementation of the supplementation of the supplementation of the supplementation of the supplementation of the supplementation of the supplementation of the supplementation of the supplementation of the supplementation of the supplementation of the supplementation of the supplementation of the supplementation of the supplementation of the supplementation of the supplementation of the supplementation of the supplementation of the supplementation of the supplementation of the supplementation of the supplementation of the supplementation of the supplementation of the supplementation of the supplementation of the supplementation of the supplementation of the supplementation o method of mounting and preserving the insects is known, the next thing to be terflies may be found in the open fields which are covered with wild flowers or the sunny openings in the woods Here the collector must stalk them Never run after a butterfly You probably will not catch it and moreover may scare others resting near As soon as the butterfly the collector must stalk them alights upon a flower, approach it care-fully until within about five feet, then with a rapid aweep of the net capture it.

The moths are harder to find because they fly at night. The method most often resorted to by collectors is known as augaring A mixture of brown sugar, stale beer and molasses is made, and at dusk is painted upon the trees. In a few bours, if the locality is productive moths will be hovering about the trees in abundance, keeping the collector bus half the night

Naming and Classifying -When the insects are mounted they will have to be named and classified Butterflies and moths belong to the order called Lept moths belong to the order called Left dopters Few people know the difference between butterfies and moths. There are several great differences. In the first place, all butterfies have cinb-shaped an tenne or feelers, that is, the feelers ter minate in a club. All members of the order Lepidopters which have not clubabaped antenne are moths. In the sec-ond place, all butterfies are diurnal that ond place, all butterfies are diurnal that is, they fly by day, while most of the moths are nocturnal or fly by night Sev eral minor differences may be noted, the first of which is, that butterfies generally old their wings erect when at rest. wasress most or the moths fold them

Becondly, butterfiles transform
from the caterpillar stage to the winged
stage in a naked chrysalis, and moths
have a covering, no matter how primitive, which is called a co

Reference Work,-In all entomological work standard books are necessary in order to identify the specimens. Dr Hol ishing Butterny sook and in here are standard American works, and in them may be found colored plates comprising pictures of most of the butterfiles and suckin of North America, north of Mexi-







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BERTILLON AND THE BURGLAR'S JIMMY.

(Concluded from page 484) two dynamometers of unequal power Tho stronger dynamometer having a maximum capacity of one ton and designed for the measurement of vertical efforts for the measurement of verilial efforts is connected to the top of the frame by a seren, by means of which it can be raised or lowered a few inches. The low er spring of the dynamometer is attached to a beavy vertical steel plate, which sildes in grooves along the two vertical posts.
When the index of the dynamometer is When the index of the dynamometer is at the zero point, the bottom of this plate which is about 1½ in hea thick, is about % inch above the siliding horizon tal plate. In this interval is inserted a wooden board % inch thick, with its edge flush with the bottom of the vertical steel plate. The experiment is usedo by inserting between the board and the Ver tical steel plaie the end of a 'jimmy' or other burgiar's tool and endeavoring by noving the handle of the tool up and down, to produce on the board impres-sions similar to those which have been found on doors and furniture The Inde of the dynamometer moves in accordance with the effort exerted and by means of second index which remains fixed when the first returns to the zero mark the instrument automatically registers the

The figure thus obtained indicates only the vertical effort or effort of press but there is sivays a horizontal compon ent of greater or less magnitude and this is registered by a horizontal or traction dynamometer, which is attached to the

sliding horizontal steel plate
Elther of the dynamometers can be Either of the dynamometers can be used alone or both can be employed simultaneously in this way it is possible to measure the horizontals and the virtual efforts separately or in combination in the latter case M Bertilion has found that, as might be expected the horizontal effort is always much smaller than the vertical or recommendations. than the vertical or pressure effort. For example, using a lever 20 inches long a vertical pressure of 1300 pounds was ob-tained simultaneously with a horizontal traction of 330 pounds. A strong man, operating on a hard wainst plank can

operating on a naru watant plank can develop a pressure offort of 1 500 pounds The apparatus can also be turned over on its side so as to place the experimental board in a vertical position for the purpose of investigating the forting open of a door. In this case a second piere of wood is introduced to represent the of wood is introduced to represent the jamb of the door. The same arrangement in the normal position of the apparatus, is used for investigating the opening of a

drawer or a cylinder or other deak etc The idea of employing a dynamometer in the study of burglary appears so sim ple, that it is surprising that it was not done long ago Hemefurth judicial in-quiries will be guided by the results of a series of experiments which will furnis points of reference. From measurements made with the Bertillon dynamometer it is possible to discover whether the hurglarlous entrance was effected in a man. a woman a child or several persons

Finally the study of the impressions made by looks has led M. Bertillon to give these impressions distinct names accord ing to the part of the tool hy which they are produced. The word 'foulce is re-served for the impression made by the point of the tool "& oroure" for the notch made by the body of the tool in pressing on the edge of a door or plece of furni ture, and the word "peace for the indentation produced by the elbow of a 'jimory or similar tool on a plane sur face. For the identification of the tool the most valuable evidence is furnished

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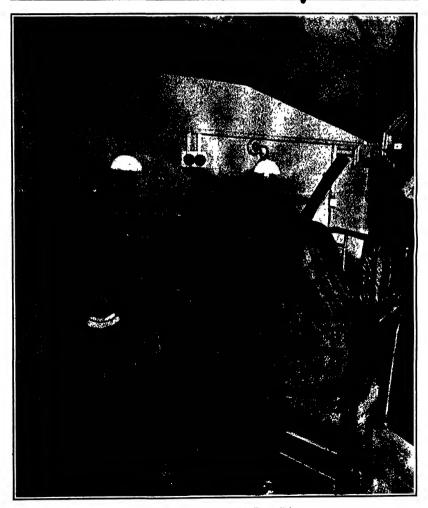






A POPULAR ILLUSTRATED WEEKLY OF THE WORLD'S PROGRESS

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NEW YORK, SATI'RDAY, JUNE 18th, 1910 ----

The folion is always plant to receive for examination illustrated articles on subjects of timely interest. If the photographs are short, the erticles short and the forts subject to the contributions will receive special attention. According to the paid for at regular space rates

#### A STREE ARCH SUGGRETED FOR THE OURSES BRIDGE

T the time when the plans for the 3,100-foot fluison River bridge were under discus-sion and it was generally accepted that nly type of structure that w itself to the then unprecedented span of \$.100 feet itself to the then unprecedented span of 3,00 feet was either the cantilever or the suppossion bridge, there appeared a remarkable paper by the well known bridge engineer Max am Ende, in which a design was presented for a steel arch bridge of 3,000 design was presented for a steel area for the property of show which was to be creeted on the cantilever principle, the load, during creetion, being carried by tring it back to suitable whore anchor ages until the final keystone was in place. recent issue of Engineering News, a similar opposition is made by Charles Worthington, for the construction of an 1,800-foot steel arch at the Quebec Bridge crossing. The elevation of the bridge arr Worthington is convinced as the result, it is a superior of the stell says at the register of the problem, that not may world as a time of the problem, that not may world as a time of the problem, that not may world as a time of the problem, that not may world as a time of the problem, that not may world as a time of the problem of the problem of the problem of the problem of the problem of the problem of the problem of the problem of the problem of the problem of the problem of the problem of the problem of the problem of the problem of the problem of the problem of the problem of the problem of the problem of the problem of the problem of the problem of the problem of the problem of the problem of the problem of the problem of the problem of the problem of the problem of the problem of the problem of the problem of the problem of the problem of the problem of the problem of the problem of the problem of the problem of the problem of the problem of the problem of the problem of the problem of the problem of the problem of the problem of the problem of the problem of the problem of the problem of the problem of the problem of the problem of the problem of the problem of the problem of the problem of the problem of the problem of the problem of the problem of the problem of the problem of the problem of the problem of the problem of the problem of the problem of the problem of the problem of the problem of the problem of the problem of the problem of the problem of the problem of the problem of the problem of the problem of the problem of the problem of the problem of the problem of the problem of the problem of the problem of the problem of the problem of the problem of the problem of the problem of the problem of the problem of the problem of the problem of the problem of the problem of the problem of the problem of the problem of the problem of the problem of the problem of the problem of the problem of the problem of the problem of the problem of the problem of the problem of the problem of the problem o

sion bridge cuttrely across the site, and sum-oil; is the individual visualoria, of which the main and is composed, from the cables, the tower ends of the composed, from the cables, the tower ends of the latter being provided with adjustment devices by which the vousours can be held in proper position during erection. The abutting faces of the vousiest would be accurately machined and provided with fagges by which each settlem after it was lowered into position would be secured to the exceed portion of the arch. The arch consists of four parallel ribs of heliow reviaugular settlem, such all free deep at wide. When the lawstome of the rown had been low wide When the keystone of the crown had been low would be slacked up and removed, and the whole suswould be slacked up and removed, and the whole su-pension bridge taken down leaving the four great ribs of the arch ready for the erection of the sup-norting columns and the superstructure of the floor rise of the area reasy for the erection or the sup-porting columns and the superstructure of the floor. The element of doubt which cuters into this design is due to the system of erection adopted it is ques-tionable whether, with the flexible support afforded by the suspension cable it would be possible to hold the rouseours with that absolute accuracy and rigidity which is necessary it is well understood that dur-ing erection voussoirs must be kept in exact position by absolutely rigid falsework. Max am Ende was to secure this rigidity by designing a fram bridge, and tying back the successive sections, as they were added, to rigid anchorages on either shore Fur thermore because of the great weight of the bridge whose dead load over the whole 1,800-foot span is entimated at 25,000 tons the erection suspension hridge would have to be extremely heavy and costly it is but fair, however to quote Mr Worthington as stating that the estimates of the total cost of the structure indicate that it compares very favorably with the cost of a cantilever structure, even if the clabo rate erection plant be considered to have no subse-quent salvage value

#### OF PROPERTY WITH THE AM ARROWAND.

T is doubtful if any one, among the many th sands who have witnessed Hamilton's special

ands who have witnessed Hamilton's speciaciiar flights at Mincola, Long Island, and wondered
at the bird like facility with which he performed
his evolutions, realised that his success was the outcome of some six thousand miles of actual flying which
had done during the next sty months.

come of some six thousand miles of actual sying whom he had done during the past six months. In qualifying for the degree of "hird man," Hamil ton has served a long apprenticeably and has traversed the whole gamut of aeronautical experience. Of light hut athletle bulld, quick but cool, endowed with that intelligent daring which is so meential to success in aviation, he has probably had a more varied experience in the air than any other living man He has been carried up by kites, has not hesitated to cut loose in gliders at disay siti tides, and sweep through perilous distances to earth, and with balloone both spherical and dirigible he is altogether familiar With so much accumulated ax perience of the "feel of the air" at command, and with perience of the "feel of the air" at command, and with his rich andowment of the natural qualities of an avi ator, it was inevitable that, when Hamilton took his seat in an acropiane, he should quickly become one of the most, if not the most, experienced and successful exponents of the new art of human flight. Starting last November with a Curtiss machine, he has spent the intervening months in touring the coun try and teaching the public to what a pitch of per fection human fight has been carried. Four days a ek, for the past six or seven months, he has given roughout the country, largely in the erhibitions th West and Southw or five different flights. Hamilton estimates that the total distance that he has flown through the pathles total distance test he has how through the patients air in the intervening period is approximately six thousand miles, or sufficient to have carried hith from New York to San Francisco and back Just here we should remark that it is fitting that a Hamilton should icave his impress so strongly on the pages of aero nautical history in the United States, since he is a insution instory in the United States, since he is a direct descendant from John H Hamilton the brother of Alexander Hamilton, John H being the great great grandfather of the present Charles K. Hamilton During a recent conversation, and at the request of

My Scylinder, 50 horse-power Curties machine was brought out, and held in position facing the wind As the propeller revolutions increased, the thrust reached a point at which the machine began to lift, and on letting go, the crowd were astonished to so me apparently flying backward. As the motor gains velocity, I first became stationary over the starting point, and then, with full power developed, traveled point, and man, with fill power developed, traveled over the ground at a speed, relatively to the ground, of ten to fifteen miles an hour." On another occasion, at St. Joseph, Miscouri, Hamilton rose and gave successful exhibitions in a wind which the local government anemometers registered at thirty nine miles. ermanet an emonuterer registeries at unitry nine min an hour The young aviator considers that the bugs hoo of the wind has been eliminated, and that from now on the skilled "bird anni" will no longer wait around for three-fourths of a windy day in the hope of making a flight in the remaining fourth It is not the velocity of the wind, but the sudden changes not the velocity of the wind, but the sudden changes in the velocity, that constitute the peril In a gusty twenty-five-mile wind, the velocity will suddenly change, in the puffs, from fifteen to twenty-five miles, a difference of ten miles per hour, and the range of difference increases with the increased speed of the

ATTOMATIC Coverent .- Asked for his opinion of the AUTOMATIC CONTENT.—Asked for his opinion of the value of automatic control, such as might be afforded by pendulum action or by the gyroscope, Hamilton surprised us by affirming that he did not solice in such control "The pendulum effect would tend to become rhythmicat, and the swing might be in the wrong direction at the critical time; on the other wrong direction at the critical time; on the other wrong direction at the critical time; on the other wrong direction at the critical time; on the other wrong direction at the critical time; on the other wrong direction at the critical time; on the other wrong direction at the critical time; on the other wrong direction at the critical time; on the other wrong direction at the critical time; on the other wrong direction at the critical time; on the other wrong direction at the critical time; on the other wrong direction at the critical time; on the other wrong direction at the critical time; on the other wrong direction at the critical time; on the other wrong direction at the critical time; on the other wrong direction at the critical time; on the other wrong direction at the critical time; on the other wrong direction at the critical time; on the other wrong direction at the critical time; on the other wrong direction at the critical time; on the other wrong direction at the critical time; on the other wrong direction at the critical time; on the other wrong direction at the critical time; on the other wrong direction at the critical time; on the other wrong direction at the critical time; on the other wrong direction at the critical time; on the other wrong direction at the critical time; on the other wrong direction at the critical time; on the other wrong direction at the critical time; on the other wrong direction at the critical time; on the other wrong direction at the critical time; on the other wrong direction at the critical time; on the critical time; on the critical time; on the critical time; on the critical time; on the critical time; on the critical t ing stratna." Where drying he a guisty which the sub-den questing feyries ming he most cold resultable grad-ually, and the facilities because the not to the harman position "with a locke early" much me a stilled risks will control a sprincial disk nemative heria. "The mis-nipulations necessary to right in asyopiane are too commitment and inter-terminal properties." nipulations necessary to right an seroplane are too complicated and inter-visited to be expaide of abso-tutely automatic control," said Hamilton, "as you will see from the following: If a pull but the right side and lifts it, there are three distinct motions necessary see from the following: It is you are an and lifts it, there are three distinct motions necessary to restore equilibrium. First the wing the or asis-rons must be set to counteract the lifting force; than the front horisontal rudder must be sharply depressed. Assess and sain velocity; and the front horisontal rudder must be sharply depressed to throw the machine down and gain velocity, the rear vertical rudder must be swing over. These movements must be dose with judgment and a delicate touch, and it is difficult for me to understand how the sensitive hand and intelligent mind of the seromant could be replaced by purely automatic appli-nance in a complicated evolution of this kind pull-ture of the seromant of the seromant of the seromant of the seromant of the seromant of the seromant of anticipation of what is going to bandon. Experience teaches the aviator to recognize different and in his manipulation of the control, anticipates the and in his manipulation of the control, anticipates the vanies of the wind. These are conditions which is and in his manipulation of the control, anticipates the vagaries of the wind These are conditions which a parely automatic control could never meet."

Total and report

Wing Strange and Supen .- Hamilton looks for our wind BERACK AND EXPEDITION HOURS for con-siderable increase in the speed of seroplanes in the near future, and believes that some of the more nowerful machines now being built will have made a erful machines now being huilt will have made seventy miles an hour péror the close of the present par Au to the far future, the high-speed racing machine will probably be a monoplane, with long, narrow wings, affording small supporting surface relatively to the horse-power One of the most interesting facts developed during the varied experience of the past six months was the accidental verification of the impormouth was the accidental verification of the hippormouth of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control months was the accidental verification of the impor-tant principle cumunistar by Pro! Langiey, that the bigher the speed of an acroplane the less is the non-any sustaining surface. It happened that in adjust-ing the engine at the commencement of an afternoon exhibition, the intake valves and carbureter caught. See a surface of the control covering of the upper and lower planes were burnt out, instruct grains 150 out of 350 square feet of surface intact. Rather than disappoint the assembled covered of 4,000 people. Hamilton determined to try for a flight. Definantly, a 100 to 130-700 run would have been sufficient, but reaminon determined to try for a might. Orninarily, as 100 to 180-foot run would have been sufficient, but in this case it was not until the machine had run over 1,000 feet, and the engine was working at its maximum power, that the machine iffted Immediately Hamil ton discovered that he was flying much faster than he had ever done before, which, of course, was stri

To is a hint that the racing machine of the future will have some system for recing, which will allow will have some system for recing, which will allow the sustaining surface to be reduced, and shin friction eliminated as the speed increase: Conversely when firing at 81 Paso, in the rarefled air due to an eteration of 3.980 feet. Hamilton found at first that he could tion of 3,840 feet, Hamilton found at first that be could not set off the ground at all The autaining planes were lengthened, and 135 aquace feet were added to the control of the control of the control of the control to the control of the control of the control of the compilated. As the result of this experience, Hamilton believes that records of high dying in which, the ma-chine reaches the rarefled strate of air, should be ac-cepted with considerable caucity.

Not very long ago, timber was selected entirely according to its external appearance. The diameter and length of the piece, the straightness of grain, sometimes the weight, sufficed to destreation both its commercial value and its destriction to that time, on account of the difficulty of transportation, woods of local origin were almost excitavely employed. It is considered to the control of local origin were almost excitavely employed. It is considered to the control of local origin and the control of local origin. The control of local origin and local origin and local origin. Furthermore, the diversation discusses of the present desired as a control of local origin. The control of local origin and local origin and local origin. The control of local origin and local origin and local origin and local origin and local origin and local origin and local origin and local origin and local origin and local origin and local origin and local origin and local origin and local origin and local origin and local original and local origin and local origin and local origin and local origin and local origin and local origin and local origin and local origin and local origin and local origin and local origin and local origin and local origin and local origin and local original and local original and local original and local original and local original and local original original and local original or Not very long ago, timber was selected entirely

processing of the second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second secon supposed WHB frame and many officers) In case of war-Ballacting, it can recome active on the set Mallac-Single semportate for the Delaware & Brindon Rain-ring, fig. for all playered to note that the frow Frame-ring, fig. end alphared to note that the frow Frame-of the supplies, each weighing about 5,000 pounds, are spill at vasadients onest steal, having a tendis strength of 99,978 pounds per square both and an elastic little fig. squares both of 6,594 pounds, as determined by finds-made while the frames were at the foundry.

A dispetch from Berlin states that the "Von der A dispatch from Berlin states that the "You der Tunn," the first of the German devastought cruisers, sindelid, on her jevilminary trials, a speed of \$1 knot, 7th, if tree, places her, in respect of speed, abreaux of the British "lawinoisbes." The latest accounts credit file with earrying eight, 11-not, mus disposed in four therein, one forward, one aft, and two on orderio amid-ships. The displacements is about 19,000 tran.

Figures fast compiled by the Pennarymain Rail-rook system, show that slitheugh in 1909 and 1909 its various lines carried a total of 1997,68,656 passenger on its 49,400 miles of track, cally one passenger was killed as a result of a train week. In other words, the chance of a passenger losting his life in a need-fent on the Pennarymain Railroad system was one dent on the Pennsylvani out of about 200,000,000

Out of about source, or The save beaut which conducted the tests of the ship brake recently fitted to the battlershy "Indians," reports that, though it will stop a vessel in a short distance, it to unsuitable for naval uses. It considers that unless the brake were constantly supplyed it would become desgred with barranches. It would be the save that the save that the save that the save that the save that the save that the save that the save that the save that the save that the save that the save that the save that the save that the save that the save that the save that the save that the save that the save that the save that the save that the save that the save that the save that the save that the save that the save that the save that the save that the save that the save that the save that the save that the save that the save that the save that the save that the save that the save that the save that the save that the save that the save that the save that the save that the save that the save that the save that the save that the save that the save that the save that the save that the save that the save that the save that the save that the save that the save that the save that the save that the save that the save that the save that the save that the save that the save that the save that the save that the save that the save that the save that the save that the save that the save that the save that the save that the save that the save that the save that the save that the save that the save that the save that the save that the save that the save that the save that the save that the save that the save that the save that the save that the save that the save that the save that the save that the save that the save that the save that the save that the save that the save that the save that the save that the save that the save that the save that the save that the save that the save that the save that the save that the save that the save that the save that the sav be dangerous in close evolution, and would at all tin somewhat retard the speed of a ship

Secretary of the Mavy Moyer announces that he has approved the plans of the two new battleships which have been voted by the Senate and House. Each will be of \$7,000 tons displacement and will carry an arms ment of ten of the new and extremely powerful 14-inc great. In general appearance, in armor plan, and in disposition of the guns the new ships will resemble the "Florida," which was recently launched at the Brooklyn navy yard.

Brooking many seru.

A comparison of the strength of the navies of the
world in dreadcoughts shows that Great Britain has
averatened of 255,000 tons displacement, Germany thrtens of 275,000 tons, the United States ten of 231,000
tons, Jagan art of 154,010 tons. Remain four of 25,000
tons, Jagan art of 154,010 tons. France has none
of the strictly developinght trye, either built or build
ing. The above Sgurey include both ships completed
and those under construction

Mollow steel masts are not the only kind that carry away. The English racing yacht "Brynhild" recently jost her solid wooden mast which, in falling, seems to have driven through the light shell of the yacht, caushave driven through the right construction of the "Brun hild" was racing against the seventy-footers "Sham rock" and "White Heather." Usually the failing must entirely clear the hull, as happened in the case of both "Columbia" and "Shamrock" I and III during their pective "America" cup racing sessons.

"The bessed of engineers appointed by the Board of Relinate of this city to pass on the plan to distribute the new Catality Massel supply; in the ractous boroughs by means of a deep tempel, one hundred feet or more below the serious, has reported that the transif would color only \$45,000,000, as against \$47,000,000, which would be considered to the lines system of type lines. The contraction is recommended on the growthe both of economical State cost in a second to the contract of contraction of the contraction of the contraction of the contraction of the contraction of the contraction of the contraction of the contraction of the contraction of the contraction of the contraction of the contraction of the contraction of the contraction of the contraction of the contraction of the contraction of the contraction of the contraction of the contraction of the contraction of the contraction of the contraction of the contraction of the contraction of the contraction of the contraction of the contraction of the contraction of the contraction of the contraction of the contraction of the contraction of the contraction of the contraction of the contraction of the contraction of the contraction of the contraction of the contraction of the contraction of the contraction of the contraction of the contraction of the contraction of the contraction of the contraction of the contraction of the contraction of the contraction of the contraction of the contraction of the contraction of the contraction of the contraction of the contraction of the contraction of the contraction of the contraction of the contraction of the contraction of the contraction of the contraction of the contraction of the contraction of the contraction of the contraction of the contraction of the contraction of the contraction of the contraction of the contraction of the contraction of the contraction of the contraction of the contraction of the contraction of the contraction of the contraction of the contraction of the contraction of the contraction of the co

tenance who show decomposition which are included by the force of the final tenant in Russian randow will have accreased accrete features. There will be also foet from, 80 feet became, 60 feet from 80 feet became, 60 feet from 80 feet became, 60 feet from 80 feet became, 60 feet from 80 fee

#### AERONAUTICS.

Capt. Baldwin and Joseph Seymour both gave ex-cellent demonstrations on the 4th instant of their pro-fedency in firing their machines. The latter's biplane is a standard \$8-horse-power Curtine, while Capt Bald win has a Curtiss machine with a tail like the Farwin has a Curtise macaine with a cast time the placed back of the planes and connected to the \$6-horse-power motor. The propeller used is somewhat larger in diam etsr and of higher pitch than that ordinarily em

Jacques de Lesseps crossed the Channel on the list day of May by way of Calais to Dover with a Biériot monoplane, and thereby won the Ruinart prize of 12 000 monoplane, and thereby won the Ruinart prize of 12 000 francs. Count de Lesseps started from the name downed at Barraques, near Calais, from which Biferiot ascended on his memorable flight. The Count ascended at ten on his memorable slight. The Count ascenaes at un minutes to four c'clock in the presence of 2,000 spec-tators. His motor was a Guome, revolving-cylinder en gine of 50 horse-power At a height of 1,500 feet be was lout in a heavy for The torpedo boat "Escopetts," which performed a similar service for Diériot and which performed a similar service for Diferiot and Latham, accompanied him, but found it impossible to keep up De Lesseppe was unable to adhere to his course, partly perhaps because of the fog, and as the "Bacopetta" entered Bower, no one know any thing at all of De Lesseps. He had handed about two miles to the north of Dover, near St. Margaret, and siglided down a distance of about two miles after glided down a distance of about two miles after with ting off his motor. He alighted at twenty two minutes after four, after a journey of forty-two minutes.

sing of his motor. He slighted at twenty two minutes after four, after a journey of forty-two minutes.

After Gount for a journey of forty-two minutes.

After Gount de Lesseph flight across the Magish Channal with the Biefold monoplane on May Jist (which was the second time this trip had been made by any seroplane), the Hom Charles Stewart Rolls, who was the first Englishman to fly with a Wright highan, on Jisten End accorded in making a double biplane, on Jisten End accorded in making a double biplane, on Jisten End accorded in making a double start was made near Dover at 8 30 P M., and W. start was made near Dover at 8 30 P M., and the start was made near Dover at 8 30 P M., and the returned to Bangand, and landed some delation for simulation. After circling twice above the citize for returned to England, and landed some delations from the count. Altern the low countries was a start of the land of the land of the land of the land of the land of the land of the land of the land of the land of the land of the land of the land of the land of the land of the land of the land of the land of the land of the land of the land of the land of the land of the land of the land of the land of the land of the land of the land of the land of the land of the land of the land of the land of the land of the land of the land of the land of the land of the land of the land of the land of the land of the land of the land of the land of the land of the land of the land of the land of the land of the land of the land of the land of the land of the land of the land of the land of the land of the land of the land of the land of the land of the land of the land of the land of the land of the land of the land of the land of the land of the land of the land of the land of the land of the land of the land of the land of the land of the land of the land of the land of the land of the land of the land of the land of the land of the land of the land of the land of the land of the land of the land of the land of the land of the land of the l

regular and tags: surrounset on a tentry Farman or plane Starting from Chalous at 440 A M the offi-cers few 176 kilometers (109 % miles) cross-country to the artitler park at Vinoennes, which was reached at 7 10 This flight of two and on-half hours' dura-tion was accomplished at a speed of 45% miles per hour. Capt. Marconnet was able to take photographs and make accelerate the would have been of great and make sketches that would have been of great gic interest in time of war. This is the first practical demonstration of the aeroplane for scouting purposes, in addition to its being a new world's rec ord for cross-country flying with two men in the ma chine Another French aviator, Labouchère, flew for ten minutes with two passengers at Mourmalon on

Pervisors to attempting a long-detanase flight from New York to "Pathadepinha and back, Mr Island New York to "Pathadepinha and back, Mr Island gave some beautiful exhibitions of his skill in flying at Mimook the first week in June 19e would rise to a height of from 300 to 300 feet and circle about, at the same time swooping down to within 15 or 30 feet of the ground and suddenly rising again. When he was shown to slight he would shart off the motor at a was about to alight be would shat off the motor at a good height, and dive almost perpendicularly to the earth. When only 10 or 13 feet from the ground be-would level up his machine, and make an archive gilds only a few feet above the surface. He appeared for ries in the biphane as easily and with the most skill that a hardnest rifer rifes his horse, and he seamed to take as much suforment from his diver-dicular prants as did the large number of interested owner prants as on the large number of intersects projektory. The machine he has used since last win ing at the identical reser used by Mr Corties at Haplins. It is very fast, and he as not demonstrated the civility in early two paople, since Mr. Hamilton took and a street of the contract of the civility of the street of the civility of the civility of the civility of the civility of the civility of the civility of the civility of the civility of the civility of the civility of the civility of the civility of the civility of the civility of the civility of the civility of the civility of the civility of the civility of the civility of the civility of the civility of the civility of the civility of the civility of the civility of the civility of the civility of the civility of the civility of the civility of the civility of the civility of the civility of the civility of the civility of the civility of the civility of the civility of the civility of the civility of the civility of the civility of the civility of the civility of the civility of the civility of the civility of the civility of the civility of the civility of the civility of the civility of the civility of the civility of the civility of the civility of the civility of the civility of the civility of the civility of the civility of the civility of the civility of the civility of the civility of the civility of the civility of the civility of the civility of the civility of the civility of the civility of the civility of the civility of the civility of the civility of the civility of the civility of the civility of the civility of the civility of the civility of the civility of the civility of the civility of the civility of the civility of the civility of the civility of the civility of the civility of the civility of the civility of the civility of the civility of the civility of the civility of the civility of the civility of the civility of the civility of the civility of the civility of the civility of the civility of the civility of the civilit

#### SCIENCE.

Prof. Dr. Mergerell, of Strasburg, president of the International Commission on Scientific Aeronautics, international commission of Scientific Aeronautics, will accompany Count Spitabergen this summer, and will carry out a sortes of serological observations in that vicinity For this reason it is proposed to hold the "international week" of kite and balloon observations, in which meteoro-logical institutions in all parts of the world partici pats, from the 8th to the 13th of August, this year, end of during November, as previously inter

hates of during November, as previously intended Bernard Strumbes, director of the observatory of Payde Dime, and professor of physics in the faculty or sciences at ICE/monts-Fernard, is deed at the age of 43. He was the author of many memoirs on physical and meteorological subject, and of late had been prominent as the champion of the new methods or weather forecasting introduced by O dulibert of Carn Frunbas endeavored to suplain on theoretical grounds the methods defended empirically by Guillert, put the extensive potentics on this subject in the scientific corrections to the total or procedure results for the procedure of the configuration of the scientific corrections on the total one procedure results for the procedure of the configuration of the configuration of the scientific corrections on the total one procedure results for the procedure of the configuration of the configuration of the configuration of the configuration of the configuration of the configuration of the configuration of the configuration of the configuration of the configuration of the configuration of the configuration of the configuration of the configuration of the configuration of the configuration of the configuration of the configuration of the configuration of the configuration of the configuration of the configuration of the configuration of the configuration of the configuration of the configuration of the configuration of the configuration of the configuration of the configuration of the configuration of the configuration of the configuration of the configuration of the configuration of the configuration of the configuration of the configuration of the configuration of the configuration of the configuration of the configuration of the configuration of the configuration of the configuration of the configuration of the configuration of the configuration of the configuration of the configuration of the configuration of the configuration of the configuration of the configuration of the configuration of the configura

A fund has been established by Mrs E H Harriman for the collection of complete data on mammals and other animals of the North American continent D C Hart Merriam chief of the biological survey of the Department of Agriculture, will realign from the gov-ernment service to take charge of the work. The late Mr Harriman was intensely interested in nat-It was with his financial support that Dr Mer riam visited Alaska a few years ago and collected cal knowledge of that region

Attempts are being made to produce taxtile imitations, equal or superior to natural furs in color, gloss, and adaptability to the ever-changing dictates of fashion, and very much cheaper. The substitution would have the further advantage of releasing the would have the further advantage of refeasing the matural skins, especially goat skin, for use as ieather Mohair and other long-staple wools are most suitable for this purpose. A recent issue of the Faerber Zei tung contains a detailed description of the process of making imitation furs, including the operations of

to the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the Pomerania 123 per cent, Saxony 134 per ce average height of the recruits from the north of Ger many exceeds that of the recruits from the south The average height for the whole empire is 60 inches the sverage for Meckienburg, Schleswig Hoistein, and Oldenburg is 66½ inches, and the average for Saxony and Biksia is only 651/2 inches

and Silveia is only 53%, inches

Carbornadus, which consists cascuttaily of allicon
carbide its produced in the electric furnace from a
mixture of sand, coke, sawdust and rommon salt. With
the exception of the diamond, exrbornadom is the
hardest of all known substances, a ratching even
corundum, which is the hard-st of natural stones axequit the diamond. The rommor has production of casequit the diamond. The rommor has production of cashorundum was first accomplished by Acheson, and the Carborundum Company which he founded pro-duces in its works at Niagara Falis large quantities of queen in its worza at ringara raiss ingo quantities or carborundum, which is in great demand as a pollabing and grinding material. The carborundum hitherto produced contains a trace of uncombined exhon and consequently has a dark brown or black color, which makes it unustable for decorative purposes. Recently however Frank Tone of the tarborundum Company, has devised a method of producing coloriess and trans-parent crystals of carborundum, the refractive index of which is said to be even greater than that of the diamond. Those crystals are produced by charging the furnace with a mixture of d0 parts of pure carbon, 37 parts of quarts, 9 parts of sawdust, and 4 parts of sait. All trace of color is removed from the crystals sait. All trace of color is removed from the crystals by the addition of a small quantity of a metallic oxide, such as oxide of chromium. As the refractive power of the diamond is one of its most valuable properties, and the carborundum crystals possess this property. in a still higher degree, these new gems may be serious rivals of the diamond, if they can be proin suitable shapes and sizes, and can be cut and policed like dismonds.

# TELEPHONIC STETHOSCOPE

BY THE ENGLISH CORRESPONDENT OF THE SCIENTIFIC AMERICAN



Telephone relay with caring removed

Great is terest has been center d among British tele phonic and medical circles in the interesting device invented by Mr S G Brown which was recently dewrited by mr is or brown which was recently us writed before the Institution of Electrical Engineers The vital feature of this invention is the successfu The vital feature of this invention is the accessful perfection of a telephone rejux For many years in rentors have been trying to develop such a relar but have been hadrich by difficulties which many engineers have declared to be uncernountable. As the outcome of aty years patient study and experiment however Mr Brown has achieved success as tests over the truth telephone lines of Great Patials have atribut return to the continues of the period of the continues of the period of the period of the period of the period of the period of the period of the period of the period of the period of the period of the period of the period of the period of the period of the period of the period of the period of the period of the period of the period of the period of the period of the period of the period of the period of the period of the period of the period of the period of the period of the period of the period of the period of the period of the period of the period of the period of the period of the period of the period of the period of the period of the period of the period of the period of the period of the period of the period of the period of the period of the period of the period of the period of the period of the period of the period of the period of the period of the period of the period of the period of the period of the period of the period of the period of the period of the period of the period of the period of the period of the period of the period of the period of the period of the period of the period of the period of the period of the period of the period of the period of the period of the period of the period of the period of the period of the period of the period of the period of the period of the period of the period of the period of the period of the period of the period of the period of the period of the period of the period of the period of the period of the period of the period of the period of the period of the period of the period of the period of the period of the period of the period of the peri

This r lay will his shown in the accompan-ill stration and the design of which may be said from a reference to the explanatory diagram is



Fig 2 -The reed and contact Fig. 8 - kicctrical or

veloped upon entirely new lines and is based upon the researches of Prof J J Thomson Earhart Kins ley and others concerning the flow of electrons across a microscopic air gai between two conducting surfaces at different potentials. Earhart found that when the stallic circuit is broken by a minute opening of mintallie circuit is broken by a minute opening of the order of 0000005 continuers and the metal at the point of interruptic is platinum the current will flow round the circuit and screen the opening and when this interrupting space which Mr Brown terms the conduction space is sulfarly altered in length the resistance is varied and the vatue of the current forwing round that circuit is greatly affected. This constitutes the fundamental heals of Mr Brown is in the conduction of the current of the current of the constitutes the fundamental heals of Mr Brown is in rention for he points out that this conduction apace is just what is wanted for the current carrying device of a telephone relay where microscopic mechanical movements have to be converted into large current changes But the dimensions of this conducting space are no minute that it is

passes through an feetric are ismp strikes and main tains the length of the arc.

In the disgram Fig 1 there is a permanent mag not N which is continued by soft true point right up to but not touching the inver steel read P. Two sets of cell windings H and X are wound round these soft iron yole obtained one and the telephone current to be magnified errelates round the winding H and con-sequently by vagring the magnetism set the read P in wheating. Shere are top and bottom metal one took please M and O which are opened to as infin-

are so minute that it is a difficult matter to insure and maintain it by mechanical means. Therefore he devised a method whereby the current flowing across the conducting space effects its own adjustment in very much the same manner as the current that passes through an lectric are ismp strikes and main itesimal degree by the fine adjusting screw W, and by the action of the local current passing through the contact and around the winding I It is the action of the local current operating through this winding which forms and subsequently maintains the conduc

tion space

This automatic adjustment is so absolutely per
fect that the instrument may be turned upside
down and yet produce scarcely any appreciable alter even and yet produce searcely any appreciable after stitus in the value of the local current and excitally without caserdsing the slightest effect upon the action of the relay The regulating winding X however must not act when traversed by the rapidly varying telephonic currents and this end is assured by sur-rounding the iron under the coll by a closed dereuited copper sheathing Eddy currents set up in this sheath ing by mutual induction destroy the stell induction of the coll in the instrument librariated heaveilth the contact between the resed P and the centact pieces M and its induction of the relation of the coll in the pencil (Fig 3) with the lower cas fast and affixed to the reed Both are polithed and work under a small drup of thin oil.

the reed sood are positive interest many the depth of the ready are shown in Fig. 1. The connection of the relay are shown in Fig. 2. The connection of the relay are shown in Fig. 2. The resistance required to be intended enter by the resistance required and circulate between the winding R At C is a day cell of normal voltage at R the look resistance required and the resistance and at D an ampere mere or current indicator. The relation to relating the resistance and at D an ampere mere or current indicator of the relation to reduce the local current to half its maximum value. The excent is dopened so at or reduce the local current to half its maximum value. The excent is which it maximum value. The excent is which it maximum value is the rest value of the investion is that the intensification or resumd is assumed applies. The relation of the investion is that the intensification or resumd is assumed applies.



e two relays in

tanctions is the commany to place two rearys in tandem by which means magnification is increased to 400 times. Moreover if a piece of goff rubber be made to touch the reed to assist the natural electrical damping of the reed the voice can be transmitted more distinctly and clearly than econversation were taking place in a room owing they to the complete absence of school

The introduction of the local regulating winding K converts the metal contacts M and O into microphones converse the mean contacts at and 0 into microphones of axtreme delicacy securing a far finer degree of sen sitivaness than could be obtained by light pressur-between carbons. In view of this fact Mr Brown con titued his investigations and succeeded in evolving an electrical stathoscope whereby the sound of bear



A THEOREM STREET



Combined stethescope and telephone relay.



Riestric stathescape with transmitter removed.

ats and other internal organs is very greatly magni

This stethoscope is highly ingenious and its design is shown diagrammatically in Fig 4 while the photo graphic illustration conveys an idea of its general praphs illustration coavey an idea of its general appearance Ta transmitter if such its may be sermed represented by A comprises a shallow brase cell faced with a this displayagm of should: This to placed upon the body in the region of the heart or other organ to be azamined as with the ordinary instrument, and the sound of the best or movement is conveyed to the sounds displayagm then to the air within the title H to which the transmitter is connected setting the metal displayagm D in whethout. The contact pieces If and O are fashioned of commin iridium M beings mounted on the displayagm D and O on the steel reed

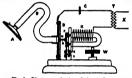


Fig 4.-Diagrammatic view of the steth

The reed, together with the magnet N H is su ported on a brass frame H pivoted or hinged at its lower support Y The conduction space is produced between the contacts M and O by the fine adjusting serve W and by the automatic action of the load-current flowing from the cell C through the winding E and round the magnet A special telephone trans-former of equal windings of about 30 other resistance is represented by I' in the primary and in the second-

ary With such an intrument set this the some of With such as intentioned about three times: the run heart beat is intentified about three times: the run has a such tanguistostion is insufficient the practical part of its Torvan connects this this house relate, as plant sometion to the transference veloce 2 and the trop the ments bring about a sound magnification of about times or more -

#### NEW SYSTEM OF COLOR PHOTOGRAPHY

Babe file intreduction of the Lemmers autochrome prospective points within the hast three years, upon plat a comparity color picture is made at one operating a direct of the conners, cutte an importun has been up to proprevenests in this line, which will overhe quit of the different or of the process of the time that the process of the time of the country duplement outer plants of the different process of the time of the country duplement outer plants control for mecounic expectation in the

The new mystem we are about to describe has this articular feature, that duplicate color pictures can so obtained as Mbifess from the first negative obtained a the camera. It has been perfected and simplified th the camers. It has been perfected and simplified by Mr Prederick II I was of this city and is quite unique in the way certain apparent difficulties are

sales in the way certain apparent difficulties are revenous.

The process in heard on the merging of the three primary color, red, thus, and green It is not three primary color, red, thus, and green It is not the properties a simple in operation as the autochrones process but the following definite adventages over that The seattive plates used keep better developing successfully when several mothers developing to the seat of the process of the procession of the procession of the seat of the seat of the procession of the procession of the procession of the procession of the procession of the procession of the procession of the procession of the procession of the procession of the procession of the procession of the procession of the procession of the procession of the procession of the procession of the procession of the procession of the procession of the procession of the procession of the procession of the procession of the procession of the procession of the procession of the procession of the procession of the procession of the procession of the procession of the procession of the procession of the procession of the procession of the procession of the procession of the procession of the procession of the procession of the procession of the procession of the procession of the procession of the procession of the procession of the procession of the procession of the procession of the procession of the procession of the procession of the procession of the procession of the procession of the procession of the procession of the procession of the procession of the procession of the procession of the procession of the procession of the procession of the procession of the procession of the procession of the procession of the procession of the procession of the procession of the procession of the procession of the procession of the procession of the procession of the procession of the procession of the procession of the procession of the procession of the procession of the procession of the procession of the processi

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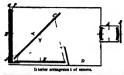
A special camera is required to make the triple negatives but it is very simple and can be used without
change for all ordinary kinds of photography with
plates or films

change for all ordinary kinds of photography with plates or dims.

When it is desired to make a set of triple negatives for color photography a trickromatic plate pack consisting of three sanstitude plates held together as one is used in the special plate held together as one is used in the special plate holder instead of a time plate belief in the special plate holder to the test plate belief has been inserted as to preduce by one expointre three negatives representing the tree primary relors. The plate pack consists of a red sensitive and a gross ensuitive plate with the sensitive or film surfaces in contact held between a backing ord and a blue-ensuitive plate which is hizsped thereto acried in the plate holder the red and prosecentiative seried in the plate holder the red and prosecent in the plates are related by ledges and are pressed in these contact film against tim by a spring on the lid but it falls or passes outward between the ledges. When the hise-sensitive plate is made slightly shorter so that it falls or passes outward between the ledges. When the hise-sensitive plate is made slightly shorter so that it falls or passes outward between the ledges. When the hise-sensitive plate is made slightly shorter so that it falls or passes outward between the ledges. When the hise-sensitive plate is made slightly shorter so that it falls or passes outward between the ledges. When the hise-sensitive plate is the stripler as shown in the diagram and the usual componenting covers in placed over the iess tube. These the powers is made by means of a tube to the Time the ex-posure is made by means of a tube to the three the powers in made by means of the letts shutter which is

said to be shout as long so that required for an autochrome plate Referring to the diagram, A is the lens having a

compensating color erress B attached to it which equalises the exposure for the three images and per fects the color selection O is a binged transparent





The plate helder is inserted at the bark of the camera under a ground glass frams held by springs in the seast way. Thousaing is done by moving the heat he will be the property of the plate of the plate of the plate of the plate of the plate of the plate of the plate of the plate of the plate of the plate of the plate of the plate of the plate of the plate of the plate 
In making positive duplicates on the film it is only necessary to reverse the position of the print from the positive-positioned negatives to make all three positive positive-positioned negatives to make all three positive prints evancide when bound together between two glass plates to form one harmonious transparent colored picture. The collodion positive film is so than that accurate registration of the three films is not

## WIRELESS TIME SIGNALING TO SEA FROM THE EIFFEL TOWER



#### BY F HONORE

The wireless telegraphic station of the Rife! Tower is now signaling Paris Observatory tims to all reserve within a reduce of 1600 miter. The present station is using 15 to 16 horse-power. When the new Installation whose completion was delayed by the record foods is fashabed 100 horse-power will be at the discount of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of th graph mean time to various centers in Paris and cidereal clocks which serve to regulate this seem time. The matter clock in question itself indicates mean time with reference to the meridian of Paris. Inclosed in a giase case and suspended from a valid or little that vibrations in measory and variations in tempera-ture cannot effect the mechanism it is corrected each any if mecessary by means of a magnetic requisitor. The rod of the pended and the property of the pended and of which be produce carries is magnet the lower and of which he produce are sufficient to the carries. end of which is spaced a rew minimeters from a soien old. Depending upon the direction of the current which is sent through the sciencid, the magnet is at irmeted or repelled thus retarding or accelerating the best of the pendulum. In this manner a lost second is regulated in thirty-six minutes.

is regulated in thirty-six minutes.
The clock is connected by wires with the key of the vipuless station of the Miffel Tower. At midnight sat 1816, and at 18 64, the clockwork automatically



CLOCK WHERE AUTOMATICALLY TRANSPORTED TIME.

Scientific American

completes a circuit, thus actuating a Morse key and causing Hertaian varies to be emitted. The observatory itself is not consistent of sur-transparent connected with telephonic receivers. On the other hand by means of a Morse, key in the circuit of an ordinary telegraph systen independent of the clock the whrites apparatus on the Silfel Tower can chock the whrites apparatus on the Silfel Tower can

clock the whreless apparatus on the Billel Tower can be operated from the bar valour. At the proper time each day an official does a tel-phone bendpiere and proceeds to the work of notify ing vessels at see of the orrect time. One finger on the Mores key has eye glued to the end of a reading telescope the official watches the best of the pendulum At 111 fb he of presset the key and by means of agreed signals he attracts the attention of vessels in the range f at in A mindinght the clock automatically signals the h ur This transmission of time is rep at 1 twice as we have said namely at 12 02 and at 12 4 precede i y other combinations of warning sig-nals. Hence vessele receive the time thrice in five

n ut s

The officer on board the vessel at ses is similarly
quipped with a telephone headpiece and he watches

I have ometer instead of a clock Making due allow
since for jossible errors of observation he estimates
the error of his chronometer

In last weeke 8 rmr > American Surrimment we hro let d the fact that a new international language has made its appearance which is a strictly accentific has made its appearance which is a strictly solunting atten pt made by an international commission of phi-losophers scientists and pitologists to improve Empe-anto and to provide the world with an artiscal lea-guage which shall be tr ly international Some of our Emperantist friends have misunderstood the pur-pose of the commission and do not fully realise the

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ete in Zamenhof s Krestomatio I Rud for example (p. 383) hisy isty sensatisajegal koj heestel jõmoj kiuj onsistau filisojad: pri ghi and (p. 283) tion chi ankoru: os tau la apero de la unua arta haguo antau- et die kaj antaudiris chiuj tiuj emmentaj hegoj kiuj eta The method of writing x in also Rugsian etc The method of writing z is also Russian channess chempts of an and also chapped elapsiodi also he for ex Frunch words with of take sei in Be peranto when they are spelt in this way in Russian e z irroteuro tuoleto vuolis othessime they are spelt with oir or i se forior jois joino Nacio tredicto etc instead of i-nos is also Russian Russian maga has do teleda salo impired with word formations as ejeptoril and serabipipi institud of the international promusor and exchapped (Russian reproservior and lewis at and ecleor (Basian represents task seems and ecleor (Basian represents a month of the common suspense cleor and endepolisison). The postilarity of using the adverb fusion of the adjector in such cases an erior access exist it is necessary to see its probably to be ascribed to the incention of the Resalan adverby with the neutrocorrespondence of the Resalan adverby with the neutrocorrespondence of the Resalan adverby with the neutroneutron of the Resalan adverby with the neutroleaves of the Resalan adverby with the neutroleaves (and the second of the Resalan adverby the second of the resalant and the second of the resalant and the second of the resalant and the second of the resalant and the second of the resalant and the second of the resalant and the second of the resalant and the second of the second of the general second of the time second of the second of

Commenced by the and of circuits and ordered used in many cases where the simple yeld would be sufficiently are to be accounted for by Russian magnet. "Naturally I do not cheek to the importation of national possibilities into the international assembler commenced between the latter is controlled thereby are an extra the latter is controlled thereby are an extra the latter is controlled thereby are all the commenced to the formation and flavoude languages in the commence to the power of Romance languages in preferences to the power of Romance languages in this respect and combine it with the more Romance characteristics of forming hew words by means of derivative spitables. But peculiarly these of national languages which render metal comprehension and international magnetification are the most carefully avoided.

The unpractical nature of the circumfaceal letters has been infected it may be remarked here how

The unpractical nature of the circumtersod iscurs has been indicated it may be remarked here how ever that in point of system Eansenhof s letters are very inferior to the similar cones employed in the Casch languages since the parallelism in sound between x and x and y is diagnised by the choice of letters. This produces a very amateurish

effect. Beside the familiar parts of speech which are in dicated by special terminations Mamenhof invented a new class characterised by the termination. su (box it was element) but the limits of this class which in cludes some but not all adverbs and prepositions are not clearly defined

are not clearly defined Many words attem from existing languages are disguised subdet after the fination of Velogich bodguised subdet after the fination of Velogich bodguised subdets after the fination of Velogich bodforman choiciers Rugilals responsed that French our
furmed from the fination of the fination of the changed meaning) of in this catagory is not classed the satonishing sepre (entirety) which is detived from the Russian superpasses, just as if one were to take from the German word subdelay; the
first two cylindes and propose sube as an interactional word instead of sheeker. The communit is the
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seriously discussed succeeded in produ was in many respects superior to the a was in many respects superior to the attempts of that time and which has proved in practice a serviceable though very imperfect means of international com

The Government and the Invence.

We recently commented upon a Mil which is being considered by the House of Representatives, the purpose of which is to companie thous trusters whose inventions have been appropriately by the government. Since the publication of our remarks further test month as been taken before the Committee on Patents, which reveals the hardships of an inventor who end to be constituted to the Committee on Patents, which reveals the hardships of an inventor who end to be done to be done to be done to be done to be done to be done to be done to be done to be done to be done to be done to be done to be done to be done to be done to be done to be done to be done to be done to be done to be done to be done to be done to be done to be done to be done to be done to be done to be done to be done to be done to be done to be done to be done to be done to be done to be done to be done to be done to be done to be done to be done to be done to be done to be done to be done to be done to be done to be done to be done to be done to be done to be done to be done to be done to be done to be done to be done to be done to be done to be done to be done to be done to be done to be done to be done to be done to be done to be done to be done to be done to be done to be done to be done to be done to be done to be done to be done to be done to be done to be done to be done to be done to be done to be done to be done to be done to be done to be done to be done to be done to be done to be done to be done to be done to be done to be done to be done to be done to be done to be done to be done to be done to be done to be done to be done to be done to be done to be done to be done to be done to be done to be done to be done to be done to be done to be done to be done to be done to be done to be done to be done to be done to be done to be done to be done to be done to be done to be done to be done to be done to be done to be done to be done to be done to be done to be done to be done to be done to be done to be done to be d

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This is so broad that the Government obviously intringed.

The trolley cystem has since lowe used to destite the Davis torpolo gam. Mr Bereiter wrote specifie the brain torpolo gam. Mr Bereiter wrote specifie the heavy Department asking for companied for fight use of his investment. The Narry Department, replied that the Bleetrie Book Company was making the speak of the Davis torpolo ulthough as a master of Basi, the contents were actually confined by reflever of Basi, the contents were actually confined by reflever of the Autority of the parties and the properties of the parties and price demanded and finally ended in a first retinal to Part.

o a controvery on the scope of the patent and the price demanded and finally meded in a flat retical to PAY Another shining example is to be found in the utilization by the Government of Prof. R. A. Passenders improvements in twiscless communication. Prof Passenders in the control of the property of the property of the property of the property of the property of the sarry laventions were proceed curries the employment but all of this later ones have been produced above. So the property of the property of the United States and have been suckained. In transments of dams have been suckeded. The unsurface property of the property of t

by the Kropp Company against General Croster Chair of Ordannes in which it states for an injunction to restrict him and his subscribinates from making runs for the array ascording to the Kropp patent. Then the the season up for decision in the Court of Appeals the case came up for decision in the Court of Appeals and the Court of the Court of Appeals and the Court of the Court of the Court of Appeals and the Court of the Court of Appeals and the Court of the Court of Appeals and the Court of the Court of the Court of the Court of the Court of the Court of the Court of the Court of the Court of the Court of the Court of the Court of the Court of the Court of the Court of the Court of the Court of the Court of the Court of the Court of the Court of the Court of the Court of the Court of the Court of the Court of the Court of the Court of the Court of the Court of the Court of the Court of the Court of the Court of the Court of the Court of the Court of the Court of the Court of the Court of the Court of the Court of the Court of the Court of the Court of the Court of the Court of the Court of the Court of the Court of the Court of the Court of the Court of the Court of the Court of the Court of the Court of the Court of the Court of the Court of the Court of the Court of the Court of the Court of the Court of the Court of the Court of the Court of the Court of the Court of the Court of the Court of the Court of the Court of the Court of the Court of the Court of the Court of the Court of the Court of the Court of the Court of the Court of the Court of the Court of the Court of the Court of the Court of the Court of the Court of the Court of the Court of the Court of the Court of the Court of the Court of the Court of the Court of the Court of the Court of the Court of the Court of the Court of the Court of the Court of the Court of the Court of the Court of the Court of the Court of the Court of the Court of the Court of the Court of the Court of the Court of the Court of the Court of the Court of the Court of th

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### de Mark Bills

As the trade mark is now is and the registration by a corporation of a technical trade mark which may be in whole amen or part of its name is impossible. The Court of Appeals has held in a recent decision published in the Official Gasstein of July 7th 1908 in the ease of Kentschy Dietliberies and Wavehouse Company vo (60 Lestagéon Cleh Dietling Company that where the applicant is a corporation a trade name which is substantially a reproduction of the corporate name cannot be registered as technical composition and the composition of the corporate name cannot be registered as technical composition and the composition of the corporate name cannot be registered as technical color of the composition of the composition of the composition of the composition of the composition of the composition of the composition of the composition of the composition of the composition of the composition of the composition of the composition of the composition of the composition of the composition of the composition of the composition of the composition of the composition of the composition of the composition of the composition of the composition of the composition of the composition of the composition of the composition of the composition of the composition of the composition of the composition of the composition of the composition of the composition of the composition of the composition of the composition of the composition of the composition of the composition of the composition of the composition of the composition of the composition of the composition of the composition of the composition of the composition of the composition of the composition of the composition of the composition of the composition of the composition of the composition of the composition of the composition of the composition of the composition of the composition of the composition of the composition of the composition of the composition of the composition of the composition of the composition of the composition of the composition of the composition of the comp

scaly known in the proviousion as the excellent in the semantic Check Charles Company and the Stucess Company. The situation is anomalous. The Champion Safety Lock Company could not register its trade mark that the Champion and the Stucess Company. The situation is anomalous. The Champion Safety Lock Company could not register its trade mark Champion under the law as it now situation or as it is now interpreted by the Court of A1 sais because of the name of the company while John Smith who has no rights whalever with regard to the Champion mark may register the trade mark (belviously in the surject A bill has been introduced for the surpress and to follow the letter of the law surpress of authorities the Patient Check to great and marks and to follow the letter of the law surpress of authorities the Patient Check or mark the surpress of the company case there is, however another ricentat which must be considered. In this case the word Union may be regarded any sognetistic and carbide of course at descriptive so that possibly this is a case where the right analy shaped on the carbide of course at descriptive so that possibly this is a case where the right analy shaped on the carbide of course at descriptive so that possibly the is a case where the right analy shaped on the carbide and the surpretended and the surpretended the carbide and the carbide and the surpretended and the surpretended the surpretended the surpretended the surpretended that mark has counted by a called the Basidman Kodak Company It support that the conversable possible the surpretended that mark has come to be called the Basidman Kodak Company and showed until that tyrude mark which is a good mark should, but unregistrable because it happens to be incorposable in the farm sense of that mark has counted by the farm and the company data that the conversable processes it happens to be incorposable in the farm sense of the company and many contribution present the confidence measurements and the confidence measurements and the confidence measur

expension in the firm name or the composite name of the configuration in the configuration of the House of Representatives has also before it for considerables measure which have for their purpose the interposation or substantia or trades may their have for their purpose the interposation or substantia of research to trade may their improvement of the contract of their improvement of the contract of their improvement of the contract of the contract of their improvement of the contract of t

### Correspondence.

DESTILLING LICENSES

To the Editor of the Somerous Assumes To the Editor of the SCHENTIFIC ASSESSION I have seen in one of your SCHENTIFIC ASSESSION PUBLICATION ASSESSION PROFESSION MAINTAINE STATE ASSESSION OF THE STATE ASSESSION ASSESSION ASSESSION ASSESSION ASSESSION ASSESSION ASSESSION ASSESSION ASSESSION ASSESSION ASSESSION ASSESSION ASSESSION ASSESSION ASSESSION ASSESSION ASSESSION ASSESSION ASSESSION ASSESSION ASSESSION ASSESSION ASSESSION ASSESSION ASSESSION ASSESSION ASSESSION ASSESSION ASSESSION ASSESSION ASSESSION ASSESSION ASSESSION ASSESSION ASSESSION ASSESSION ASSESSION ASSESSION ASSESSION ASSESSION ASSESSION ASSESSION ASSESSION ASSESSION ASSESSION ASSESSION ASSESSION ASSESSION ASSESSION ASSESSION ASSESSION ASSESSION ASSESSION ASSESSION ASSESSION ASSESSION ASSESSION ASSESSION ASSESSION ASSESSION ASSESSION ASSESSION ASSESSION ASSESSION ASSESSION ASSESSION ASSESSION ASSESSION ASSESSION ASSESSION ASSESSION ASSESSION ASSESSION ASSESSION ASSESSION ASSESSION ASSESSION ASSESSION ASSESSION ASSESSION ASSESSION ASSESSION ASSESSION ASSESSION ASSESSION ASSESSION ASSESSION ASSESSION ASSESSION ASSESSION ASSESSION ASSESSION ASSESSION ASSESSION ASSESSION ASSESSION ASSESSION ASSESSION ASSESSION ASSESSION ASSESSION ASSESSION ASSESSION ASSESSION ASSESSION ASSESSION ASSESSION ASSESSION ASSESSION ASSESSION ASSESSION ASSESSION ASSESSION ASSESSION ASSESSION ASSESSION ASSESSION ASSESSION ASSESSION ASSESSION ASSESSION ASSESSION ASSESSION ASSESSION ASSESSION ASSESSION ASSESSION ASSESSION ASSESSION ASSESSION ASSESSION ASSESSION ASSESSION ASSESSION ASSESSION ASSESSION ASSESSION ASSESSION ASSESSION ASSESSION ASSESSION ASSESSION ASSESSION ASSESSION ASSESSION ASSESSION ASSESSION ASSESSION ASSESSION ASSESSION ASSESSION ASSESSION ASSESSION ASSESSION ASSESSION ASSESSION ASSESSION ASSESSION ASSESSION ASSESSION ASSESSION ASSESSION ASSESSION ASSESSION ASSESSION ASSESSION ASSESSION ASSESSION ASSESSION ASSESSION ASSESSION ASSESSION ASSESSION ASSESSION ASSESSION ASSESSION ASSESSION ASSESSION ASSESSION ASSESSION ASSESSION ASSESSION ASSESSION ASSESSION ASSESSION ASSESSION ASSESSION ASSESSION ASSE wish to call your attention to the fact that such still must be resistared with the collector of the district in which such still is located not only before opera-tion begins but immediately after the still comes into the possession or custody of such person it be a new still distillery apparatus or not

It be a new still distiller; appearatus or not. The law requires all stills ext up to be registered if for use or not. This applies to all stills or what were seen and for whatever perspect binsheded. Any still which is not registered is enabled to foreignt properly in the passaction or entirely a material property in the passaction or entirely a material property in the passaction or entirely a material property and present and found in the building or in any yard relaciours counseled with the building in which the same may be set up. The person whose duty it is to register any still failings to do no is estiply to fine and imprisonment under section 2358 Zewised Statutes (Industrial Revenue Department).

Kindly bring this to the attention of your sub ribers to avoid any difficulties

H H PERUND

#### RAISING THE MAJER To the Editor of the Screening American

The recent act of Congress authorising the raising of the wreek of the U S S Maine has given rise to of the wresk of the U S S Mains has given rise to many suggestions for raising her. The wreck has rested on the bottom of Hevana harbor for nearly twaiter years, and has do bitess estitud considerably in the mud The Mains was destroyed by the ex-posion of a submarine nin which caused the par-tial explories of two or more of the forward mass that the constraint of the contract of the reasons were that the part of the contract of the statement were that the contract of the con-traction were that the contract of the con-traction were the that were the contract of the twenty of the contract of the con-traction were the contract of the con-traction were the contract of the con-traction were the contract of the con-traction were the contract of the con-traction were the contract of the con-traction were the con-traction were the con-traction were the con-traction were the con-traction were the con-traction were the con-traction were the con-traction were the con-traction were the con-traction were the con-traction were the con-traction were the con-traction were the con-traction were the con-traction were the con-traction were the con-traction were the con-traction were the con-traction were the con-traction were the con-traction were the con-traction were the con-traction were the con-traction were the con-traction were the con-traction were the con-traction were the con-traction were the con-traction were the con-traction were the con-traction were the con-traction were the con-traction were the con-traction were the con-traction were the con-traction were the con-traction were the con-traction were the con-traction were the con-traction were the con-traction were the con-traction were the con-traction were the con-traction were the con-traction were the con-traction were the con-traction were the con-traction were the con-traction were the con-traction were the con-traction were the con-traction were the con-traction were the con-traction were the con-

41 was terribly as Therefore it of frame 41 aft is depotrial if anythic tered forwands attroyed by remaining the stroyed by remaining the same and the same and the same and the same and the same and the same and the same and the same and the same and the same and the same and the same and the same and the same and the same and the same and the same and the same and the same and the same and the same and the same and the same and the same and the same and the same and the same and the same and the same and the same and the same and the same and the same and the same and the same and the same and the same and the same and the same and the same and the same and the same and the same and the same and the same and the same and the same and the same and the same and the same and the same and the same and the same and the same and the same and the same and the same and the same and the same and the same and the same and the same and the same and the same and the same and the same and the same and the same and the same and the same and the same and the same and the same and the same and the same and the same and the same and the same and the same and the same and the same and the same and the same and the same and the same and the same and the same and the same and the same and the same and the same and the same and the same and the same and the same and the same and the same and the same and the same and the same and the same and the same and the same and the same and the same and the same and the same and the same and the same and the same and the same and the same and the same and the same and the same and the same and the same and the same and the same and the same and the same and the same and the same and the same and the same and the same and the same and the same and the same and the same and the same and the same and the same and the same and the same and the same and the same and the same and the same and the same and the same and the same and the same and the same and the same and the same and the same and t Samuel Commen tralian steam

HOW LABOR BORD THE GOT APPEAR TO ME!

To the Editor of the Scurzyzz Arrica to May To the Editor of the Scurzyzz Arrica was to people how large the sun looks to them when it is in mid beaven and you will get ten different optisions of its size which range from a silver dollar to a cart wheel The varied opinions are due to the fact that there is nothing with which to com pare it when looked at by itself Before any acru rate estimate of its size can be made we must have some known object with which to compare it

Thus when the sun is on the he to be close to houses trees and hills it looks very large. To some people it seems as large as a hous or tree. Moreover there are more persons who will or tree moreover there are more persons who will agree that it appears to be a certain fixed size under this condition than will agree when it is viewed at the senith The diversity of opinion in the latter case results from the inability of the eye to size up an isolated object

isolated object. This has been proved by projecting a narrow beam of light on a perfectly black nor reflecting errors not light on the observer could see nothing but to beam of light and had no way of judging his distance from the across The observations of several policulater those conditions revealed the fact that there was no certainty about the length of the beam the apparant length being estimated all the way from a few inches to several feet. This being the case when the sun is in mid-beaver and the size he reflected to come autifura stand how can the size he reflected to come autifura attact.

and? The most logical narver is found by representing it is a sirele located at a fixed circular form the eye. The average reader belief the printed pass about one shall from his eyes when reaches 44 this distance his sign inclinate fairly clearly the clear of the fixed that is the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the con

an inch. These same men if asked to draw a circle on the sheet that would just cover the sun's disk if held between them and the sun at a distance of one foot from the eye would produce a series of circles of magnitudes ranging from a twenty five cent piece to

The real size of the circle should be only three ixteenths of an inch in diameter

The method of representing the sun s exact sire by

The method of representing the sun s exact sire by a circle one foot from the eye is simple. Take a smoked glass hold it one foot from the eye and scratch pin marks tangent to the suns link at the four quarters. When the diameter of the circle in closed within these marks is measured it will be

four quarters. When the diameter or turn view closed within these marks is measured it will be found to be very close to it re-electronates of an itself to their words it a circle of this size were drawn and in its areas were reproduced in prejoration to an exercise as not the observer would be able to extend the size of the size were related to the size of the foreign the size of the size of the size of the size of the size of the size of the size of the size of the size of the size of the size of the size of the size of the size of the size of the size of the size of the size of the size of the size of the size of the size of the size of the size of the size of the size of the size of the size of the size of the size of the size of the size of the size of the size of the size of the size of the size of the size of the size of the size of the size of the size of the size of the size of the size of the size of the size of the size of the size of the size of the size of the size of the size of the size of the size of the size of the size of the size of the size of the size of the size of the size of the size of the size of the size of the size of the size of the size of the size of the size of the size of the size of the size of the size of the size of the size of the size of the size of the size of the size of the size of the size of the size of the size of the size of the size of the size of the size of the size of the size of the size of the size of the size of the size of the size of the size of the size of the size of the size of the size of the size of the size of the size of the size of the size of the size of the size of the size of the size of the size of the size of the size of the size of the size of the size of the size of the size of the size of the size of the size of the size of the size of the size of the size of the size of the size of the size of the size of the size of the size of the size of the size of the size of the size of the size of the size of the size of the size of the size of the si foot from his eye could examine it will scrutiny that he could examine the full m naked eye Detroit Mich

E C LANDIS

The Current Suppl

The British Antarctic expedition has started on its journey for the South Consequently the opening article of the current SUPPEMENT NO 1798 in which the equipment of the expedition is described will prove the equipment of the expedition is described will prove of interest Not so many years ago in his famous book on education Herbert Spencer jut forth a pow erful plea for the study of science Nowadays how were an advocacy of that kind is not alled for and where an anyone or that hind is not aline for and his book is at present inragly of historic value only Since that time the pendulum has been swinging too far toward the scientific Prof Albert G Keller in an article on Science and th H nantit s arg es for the inevitableness of the h manities and of h manity an article on Beiener and th H n antit a arg os for the inservitationess of the hundrities and of hundrity. He asserts not only that our lives may be enriched by the private of oil tre in diverse fora not only that our destinies must be imporrehald by the resultant of all lines are one and all the corresponding to the following the comparison of the corresponding to the comparison of the corresponding to the corresponding to the corresponding to the corresponding to the corresponding to the corresponding to the corresponding to the corresponding to the corresponding to the corresponding to the corresponding to the corresponding to the corresponding to the corresponding to the corresponding to the corresponding to the corresponding to the corresponding to the corresponding to the corresponding to the corresponding to the corresponding to the corresponding to the corresponding to the corresponding to the corresponding to the corresponding to the corresponding to the corresponding to the corresponding to the corresponding to the corresponding to the corresponding to the corresponding to the corresponding to the corresponding to the corresponding to the corresponding to the corresponding to the corresponding to the corresponding to the corresponding to the corresponding to the corresponding to the corresponding to the corresponding to the corresponding to the corresponding to the corresponding to the corresponding to the corresponding to the corresponding to the corresponding to the corresponding to the corresponding to the corresponding to the corresponding to the corresponding to the corresponding to the corresponding to the corresponding to the corresponding to the corresponding to the corresponding to the corresponding to the corresponding to the corresponding to the corresponding to the corresponding to the corresponding to the corresponding to the corresponding to the corresponding to the corresponding to the corresponding to the corresponding to the corresponding to the corresponding to the corresponding to

Crear The wonders of these excavations are told in en interesting article Mr Leon A Hackett contrib t a a very exhaustive paper on the processes of cotton The removal f sames by onvying them to a waste bunk hydraulicativ is done in connection with the temperary plant built to suppy power during the conscruction of the Rathow Falls hydroccie tridevelog of tof the Urran Falls Water Power and Jown violo ot to ft be Great Falls Water Power and Jown and to Company on the Missor i Niver near Great Fall Mont he power house is the side of a hit directly above the dego of the river bank he bittumin o a voat used is disspectly appropriate to the first good of the boil room and russ down on the sloor of the boil room and truss down on this sloor from which is need to be supported by the sloop of the company of the sloop of the boil room and to the furnices. As the sabes full through the greate they are driven out this at trust warms concretely limited trusch in the first groom version of the sloop of the sloop of the sloop of the sloop of the sloop of the sloop of the sloop of the sloop of the sloop of the sloop of the sloop of the sloop of the sloop of the sloop of the sloop of the sloop of the sloop of the sloop of the sloop of the sloop of the sloop of the sloop of the sloop of the sloop of the sloop of the sloop of the sloop of the sloop of the sloop of the sloop of the sloop of the sloop of the sloop of the sloop of the sloop of the sloop of the sloop of the sloop of the sloop of the sloop of the sloop of the sloop of the sloop of the sloop of the sloop of the sloop of the sloop of the sloop of the sloop of the sloop of the sloop of the sloop of the sloop of the sloop of the sloop of the sloop of the sloop of the sloop of the sloop of the sloop of the sloop of the sloop of the sloop of the sloop of the sloop of the sloop of the sloop of the sloop of the sloop of the sloop of the sloop of the sloop of the sloop of the sloop of the sloop of the sloop of the sloop of the sloop of the sloop of the sloop of the sloop of the sloop of the sloop of the sloop of the sloop of the sloop of the sloop of the sloop of the sloop of the sloop of the sloop of the sloop of the sloop of the sloop of the sloop of the sloop of the sloop of the sloop of the sloop of the sloop of the sloop of the sloop of the sloop of the sloop of the sloop of the sloop of the sloop of the sloop of the sloop of the sloop of the sloop of the sloop it connects with a fiume extending on a grade of about five per cent to the edge of the river bank. When the grates are cleaned the ashes are pulled into the trench and a hose stream turned into the latter t treger and a most artenut cursed must be mader at start them. They are thus pick due by and ar ried out to the river through the fume only a small amount of water being required No difficulty is experienced from clegging in the trench or flume and the current is the river prevents an accumulation at the edge of the bank.

of his countrym n in a last gallant though futile at



#### FUNG.L GARDEN OF

BY JACQUES BOYER

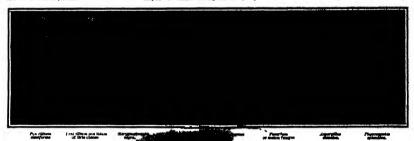
The Mycothèque annexed to the laboratory of cryptogamy of the Paris school of pharmary is un questionably the most original garden in the world it contains it sing speciments of 107 species of mode and silled rung which M Halister has gathered to lected separated and cultivated on an appropriate midlum

medium. The fungi are sown or plantid on pieces of licerico root in bottle of lichemian glass about 2 inches it administration, and the pieces of licerica root in the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the cont

Siaments of Pericilium at first simple and later branched and resembling a brush bear chaplets of green gray pulsew or reaccioned spores Minute drops of water often condense on the brush of Peri-cilium Conference producing a very beautiful effect. In order to obtain a pure and isolated species are each bottle interiopers of other species are carefully removed and the bottle if necessary is replanted two or three times "The principal function of the collection is to supply the laboratory with living specimens of accuracy purity of type for use in research and is the Unstration of lectures

illustration of lectures
The position of the curator is no sinecure When the
nutrient meterial has been exhausted the fungus will
perials unless specials methods of preserving its life are
adopted M Bainier having learned by experience

number of Europian spaces, which like the two-fold power of transforming shack and of converting gladess into alcohol as oxide Among these spaces is fisco which is frequently som growing on dewhich is frequently seen grawring on decay; taken matter Phytosopovice spidence scaling out of imments terminating in Hitle bulks. A protect process of continuous terminating in Hitle bulks. Of conditional The States of the Indian issue of conditional The States spine the daily in mandel which attacked byseed, frell and option and which attacked byseed, frell and option as food Varieton sorts of chases over Capit shall diverse to opposite of Protections Physical State States and Parlament, and Exception conversions which forwispes indicate the chosen services one which forwispes indicate the chosen services one which forwispes indicate the chosen services are also that the chosen services are which forwispes indicate the chosen services are also services and Parlament and Exception of the Capital States of the Capital States of the Capital States of the Capital States of the Capital States of the Capital States of the Capital States of the Capital States of the Capital States of the Capital States of the Capital States of the Capital States of the Capital States of the Capital States of the Capital States of the Capital States of the Capital States of the Capital States of the Capital States of the Capital States of the Capital States of the Capital States of the Capital States of the Capital States of the Capital States of the Capital States of the Capital States of the Capital States of the Capital States of the Capital States of the Capital States of the Capital States of the Capital States of the Capital States of the Capital States of the Capital States of the Capital States of the Capital States of the Capital States of the Capital States of the Capital States of the Capital States of the Capital States of the Capital States of the Capital States of the Capital States of the Capital States of the Capital States of the Capital States of the Capital States of the Capital States of the Capital States of the Capital States of the Capital States of the Capital States of the Capital States of the Capital States



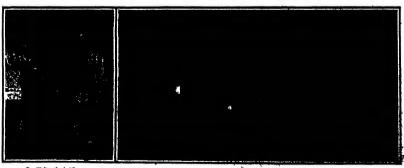
The licerice roots are deprived or their cork like bark in order to lay bare the yellow alburnum or asymod which its filled with glycryrhian a sacekarra substance which is very favorable to the development of moid fungi

Before the moid appres are sown the bottles containing the pieces of theories root are sterilized by heath them to 248 deg. In for one hour in an autoolgs. Our of the accommanying the togicaphs shows I Bain! I will give appress by removing the cetten planting the containing the cetter planting the containing the cetter planting the cetter plant and depositing a few spores on the licerice root h means of a platinum wire sheathed in a glass re means of a pintimum wire sheuthed in a giass re-free pintimum wire is settlike of passing it thereas the fance of a Bunnen burner before it is dipped its the mold utures and the cotion plug is instantity re-jusced after the sowing. The bottle is then passed in jusced after the sowing. The bottle is then passed in necessary to the property of the property of the interest of the property of the property of the interest of the property of the property of the system of the property of the property of the system of the property of the property of the grayths habry forms of property of the property of many branches and Arvorsingents roses presents the supportance of a while felt hat. The reproductive

ture has led to blished descrip-fact that the separated from we observe Mucor which alucks many especially substances Band expectatly infects horse dung Orlempsdamber ories and Rhisopse orises which are used in \$40 Orlant in the production of festimated liquors from rice Amplompers Scount or Chinese yeast which is used for the same purpose by the Chinese and was introduced into Europe by Dr Cal-mette disrector of the Partsur Institute at Lille and a

duces the characteristic green veins. The genus Aspreyilles is represented by 6 species of a crises is used in Japan in the formestation of the national heavenge sake or rice hear A funiqueties at tacks the monocon surfaces of the respiratory organs of birds and produces a pseudo-tuberculosis in pigeometism of the same produces. There are is species of Streymentopyrite including the conductation of such caused and the same produces are sufficiently by Raulin attacked we ministed by Raulin attacked we ministed by Raulin produces and the same present of the produces of the produces of the produces of the produces of the produces of the produces of the produces of the produces of the produces of the produces of the produces of the produces of the produces of the produces of the produces of the produces of the produces of the produces of the produces of the produces of the produces of the produces of the produces of the produces of the produces of the produces of the produces of the produces of the produces of the produces of the produces of the produces of the produces of the produces of the produces of the produces of the produces of the produces of the produces of the produces of the produces of the produces of the produces of the produces of the produces of the produces of the produces of the produces of the produces of the produces of the produces of the produces of the produces of the produces of the produces of the produces of the produces of the produces of the produces of the produces of the produces of the produces of the produces of the produces of the produces of the produces of the produces of the produces of the produces of the produces of the produces of the produces of the produces of the produces of the produces of the produces of the produces of the produces of the produces of the produces of the produces of the produces of the produces of the produces of the produces of the produces of the produces of the produces of the produces of the produces of the produces of the produces of the produces of

Alfred M Angot director of the meteorolo ice of France has reported to the Academy of Sci ences that no exceptional variations in terrestrial magnetism or atmospheric electricity were observed in the neighborhood of Paris during the night of May 18th 19th when Halley's comet was in transit. The meteorological observations also failed to indicate any disturbance that could be attributed to the



Sterificing the bottles.

Pleasing the hund.

pores of each arranges his week one or of cryptogams a retain their

# HE TEMPERATURE OF THE STARS

## BY JOSEPH BARTON

By mease of his heterochrone stellar photometer if Charles Nordman has succeeded in obtaining in sufficient to other interesting results measurements and the contract at the contract of the contract at the contract at the contract at the contract at the contract at the contract at the contract at the contract at the contract at the contract at the contract at the contract at the contract at the contract at the contract at the contract at the contract at the contract at the contract at the contract at the contract at the contract at the contract at the contract at the contract at the contract at the contract at the contract at the contract at the contract at the contract at the contract at the contract at the contract at the contract at the contract at the contract at the contract at the contract at the contract at the contract at the contract at the contract at the contract at the contract at the contract at the contract at the contract at the contract at the contract at the contract at the contract at the contract at the contract at the contract at the contract at the contract at the contract at the contract at the contract at the contract at the contract at the contract at the contract at the contract at the contract at the contract at the contract at the contract at the contract at the contract at the contract at the contract at the contract at the contract at the contract at the contract at the contract at the contract at the contract at the contract at the contract at the contract at the contract at the contract at the contract at the contract at the contract at the contract at the contract at the contract at the contract at the contract at the contract at the contract at the contract at the contract at the contract at the contract at the contract at the contract at the contract at the contract at the contract at the contract at the contract at the contract at the contract at the contract at the contract at the contract at the contract at the contract at the contract at the contract at the contract at the

circular aperture the light of an Oeram metallic diament lamp of four volts and one ampere. This little of the light of the light of the light of the little of the mean of a rheadst and an accurate voil meter. There is no difficulty in maintaining the differ-ence of potential between the hump terminals con-stant to within 1/100 vot by adjusting the rheadst cone or twise per hour. This corresponds to an in

various temperatures between 2550 deg F and 6 00 deg F these temperatures being measur d with the Féry pyrometer The first determinations mail with the small horisontal equatorial of the observa with the small normonial equatorial of the construc-tory of Paris and the photometer described abov showed that this method of monothromatic imag s gives in a simple manner the measurements and ratios of the total juminosity of stars free from the



ster This part of the apparatus exteriorances are to prisms the third Nevol and the quartr plate of Zoi Instance between the Soi Instance Perfect Pool to the sphotometer being aupprosed Furthermore between the forms and the experience in the common path of the rays of the real and the artificial star is pleod a sliding drum which carries interchangeable cells filled with colored liquids. In this manner a series of mono-chromatic images of the real and artificial stars can be produced. The photometric measurement is made by reddering the images of the two stars can be produced. The photometric measurement is made by reddering the images of the two stars can be produced. The photometric measurement is made by reddering the images of the two stars can be produced. The produced in the path of the rays from the artificial forms of the produced for the produced for the produced for the produced for the produced for the path of the rays from the artificial forms of the produced for the produced for the produced for the produced for the produced for the produced for the produced for the produced for the produced for the produced for the produced for the produced for the produced for the produced for the produced for the produced for the produced for the produced for the produced for the produced for the produced for the produced for the produced for the produced for the produced for the produced for the produced for the produced for the produced for the produced for the produced for the produced for the produced for the produced for the produced for the produced for the produced for the produced for the produced for the produced for the produced for the produced for the produced for the produced for the produced for the produced for the produced for the produced for the produced for the produced for the produced for the produced for the produced for the produced for the produced for the produced for the produced for the produced for the produced for the produced for the produced for the produced for the produced for th



Standardining the photometer with the aid of an electric furnece.

# The Flights of Rolls, De Lesseps, and Curtiss Compared

BY CARL DIENSTBACH

The "beavior-than-air machine' during the past few weeks has proved nearly as useful as the large modern airship, that has aiready been commercialised. When liferiot first flew across the English Channel, sureplane Blériot first flew across the English Channel, suroplans traffic seemed near But as nobody, not even the rivats in that attempt, repeated the feat, his perform ance gradually lost its convincing quality. In Ger many his frast was dubbed a "more piece of good luck." But as nobody, not even his When, however, during the last few weeks, the Chan nel was not only crossed again on a Bieriot me

nel was not only crossed again on a Biferict machino, but in quick succession the whole navigable length of the Hadson was covered in a splendid high-speed flight, and when on the heels of that triumph the Channel was crossed and recrossed in a single flight, everyone resilised that the aeroplane had on tered upon a wider field of useful tered upon a wider nois of useful ness and that it was indeed a ve-blele which is destined to be the pleasure conveyance of the future. The three flights mentioned were all over established routes of the liveli est traffic They all required a ma-chine which would not fail, under penalty of falling juto the water, and they were all between rocks or and they were all between rocks or precipitous mountain sides, which made it a problem to land in case of emergency, and which influ-enced the air currents in a way as yet so little known that even as suphyr might become formidable. That they were successfully accom-pliable by machines of so widely different types as the District moneplane and the Curtiss and Wright biplanes shows to what extent the biplanes shows to what extent the technics of fying machine construc-tion have advanced within the past year. They capt-taily emphasise the immense propress that has been made with regard to the heart

the minonae progress that near the minonae information and the man of the minonae are an exceptance to make the minonae are the status of the acceptance motor of the automobile on gains It offers certainly a more territable problem, but it seems townshable problem, but it seems the minonae are townshable problem, but it seems failing of the card; slight motors was due less to the inherent diff. Stilling of the card; slight motors was due less to the inherent diff. Stilling of the card; slight motors was due less to the hard to hard to poisso. Hand to inexperience of a top-load—blan to inexperience of out that the Curties and a Bliefted out that the Curties and a Bliefted out that the Curties and a Bliefted out that the Curties and a Bliefted out that the Curties and a Bliefted out that the Curties and a Bliefted out that the Curties and a Bliefted out that the Curties and a Bliefted out that the Curties and a Bliefted out that the Curties and a Bliefted out that the Curties and a Bliefted out that the Curties and a Bliefted out the still the curties are the still the curties and a Bliefted out the curties are the curties and a Bliefted out the curties are the curties and a Bliefted out the curties and a Bliefted out to be compared to the curties and a Bliefted out to be compared to the curties and a Bliefted out to be compared to the curties and a Bliefted out the curties are the curties and a Bliefted out the curties are the curties and a Bliefted out the curties are the curties and a Bliefted out the curties are the curties and the curties are the curties and the curties are the curties and the curties are the curties and the curties are the curties and the curties are the curties are the curties and the curties are the curties are the curties are the curties and the curties are the curties are the curties are the curties are the curties are the curties are the curties are the curties are the curties are the curties are the curties are the curties are the curties are the curties are the curties are the curtie power with which they were provided for these trips. They were not larger than the standard type but De Lesseps had a 50 horse pow or Gnome motor in place of the 24 horse-power Annani with which Bieleto free across, and Curtine also a 50 horse-power alght-cylinder motor against the usual 25 horse-power four-yilinder angine of a Curtin bilingia. Cant Rolls had Curties biplane Capt Rolls had made no attempt to double the mo-tive power of his Wright machine, hnt as he was flying alone he had considerable reserva force at his considerable reserve force at his disposal. These were all machines capable of carrying a passenger, but flying with only the pilot aboard. Consequently the motors not running continuously nn top-load any more than automobile motors.

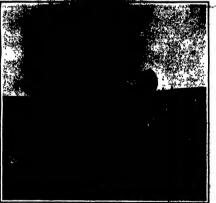
uer top-road any more tana automobile motors. Count de Lesseps used his power sparingly He made little better time than Bidriot. Even Curtiss, who was beating the "Twentieth Century Limited," says he rarely opened the throttle wide

There is another feature common to these flights, to which their success must be ascribed just as much as to more reliable motive power. It is the evolution of high flying. For trips of this nature a great clevation has the very obvious advantage of easy reckoning.

De Lesseps flow in a fog, yet, in contrast to Biériot, he
was amoet always in sight of land, at an altitude of
a thousand feet, as compared with Biériot's 306.

From the same superior level Curties saw the nonery From the same superior level Curtims may the scenery spread below him like a chart. He could make short cuts, pick his leadings, and easily decide where best to lay his course. Flying high greatly simplifies the plicits task, where low fiying would sad to the diffectities of balancing, the difficulty of following a more oless devolutes ourse while dedging obstanks. It means contecting like the strain on a figrade rider, who with his grea gives to a county read, then content to pick out a path. Though a fying pited does not hear actual content with objects below there will remains the need of allowing for heavey in stand of wind pusts, irregularities of the morter or awaying the machine. The principal actuations of being high is however, in the binoreased "ranges" it gives in dominating the six testif. ties of balancing, the difficulty of following a z

Rolls in his Wright



De Lemops in his Blériet monoplane flying across the Chantel. THE SECOND AND THIRD ADSOPLANDS TO FLY ACROSS THE EXCLUSE CHARMES.

Aviators are fast realising that it is better to en rial disturbances than to fight them. This tend aerial disturbances than to fight them. This prevent them from following any route that app the confined character of a roadway. The unfertured our mixed to see the control was seen to make the control to good as a carry irred to control to the control to the control to the control to the control to the control to the control to the control to the control to the control to the control to the control to the control to the control to the control to the control to the control to the control to the control to the control to the control to the control to the control to the control to the control to the control to the control to the control to the control to the control to the control to the control to the control to the control to the control to the control to the control to the control to the control to the control to the control to the control to the control to the control to the control to the control to the control to the control to the control to the control to the control to the control to the control to the control to the control to the control to the control to the control to the control to the control to the control to the control to the control to the control to the control to the control to the control to the control to the control to the control to the control to the control to the control to the control to the control to the control to the control to the control to the control to the control to the control to the control to the control to the control to the control to the control to the control to the control to the control to the control to the control to the control to the control to the control to the control to the control to the control to the control to the control to the control to the control to the control to the control to the control to the control to the control to the control to the control to the control to the control to the control to the control to the control to the control to the control to the control to the control to the control to the control to the control to the control to the control to the control to the control to the control to the control to the control to the control to the control to the control to the unfettered, can pick its path at any b

very opposite maneuver of altimuting the st water. He had no doubt learned this trick above Lake Keuks. The Hudson River is 'a "American Hhine," but the long narrow of Keuka reminds one of the German Rhine. gly with its long ro massive mass

bright Sunday When Curtist his epoch-making Sight to York, the greatest entery fro the water in such a riv

air's lithown is nissed rough spect to be water in most a river whiler. As a feat of hirigation Guessian and a feat of hirigation Guessian and the second special special special special special special special special special special special special special special special special special special special special special special special special special special special special special special special special special special special special special special special special special special special special special special special special special special special special special special special special special special special special special special special special special special special special special special special special special special special special special special special special special special special special special special special special special special special special special special special special special special special special special special special special special special special special special special special special special special special special special special special special special special special special special special special special special special special special special special special special special special special special special special special special special special special special special special special special special special special special special special special special special special special special special special special special special special special special special special special special special special special special special special special special special special special special special special special special special special special special special special special special special special special special special special special special special special special special special special special special special special special special special special special special special special special special special special special special special special special special spec peen sount. Glining in a same is so uninteresting, the machine in "dead alr" seems so inart land devoid at sower, that Littentiat, Pitchin, Identia, and Avery gladly preferred to risk the guests instead. Curties only reiterates what Her-

Curties only relivation what Hen-curities only relivation what Hen-questry described, when he rafeer on a feeling at the pit of the stori-sch feeling at the pit of the stori-sch feeling at the pit of the stori-sch feeling at the pit of the stori-sch feeling at the stori-ch feeling at the stories of the Curties ingestion used in the Curties ingestion used in the Curties at the stories of the Curties at the stories of the Curties at the stories of the Curties at the stories of the Curties at the stories of the Curties at the stories of the Curties at the stories of the Curties at the stories of the say to steer down, but they did not publish such tricks of the trade. Modern arisings are reals a covering for the inserties and, and the stories of the stories and a score of the septy "blassing." These in Curties is splanning now to said

## Scientific American

Departmen

AF EXTRACTOR WAITE MOVES.

Figlicially in the assempancy enquivaling is an interiority in the assempancy enquivaling is an interiority in the assempancy enquivaling in the
serior and redepending piston. The motor comprises
induced in the assemble asse



HOVEL WATER MOTOR

to the position shown in Fig. 3, water will be admitted through the passage H to the left-hand side of the piston, forcing the latter toward the right and causing piston, forcing the latter toward the right and causing it, when it approaches the end of its strikes, to force the valve rod B cutward This will cause the roder, frame to awing out, making the roller carried toward rolls on the rocker arm H, and thus turn the valve has a consider the part of with the intel C and the rocker frame will cause the rocker primage on the rocker frame will cause the rocker frame will cause the rocker frame will cause the rocker frame will cause the rocker specific product the part of B is setted appet by the plag O to return the parts to the posttion shown in Fig. 2. The investor of this water motic is Mr John N. Hardy, of 411 West Second Avmus, Celimphes Ohio.

à patent first FUE AFF TETRICA.

à patent has just been haved on an improved type of thismle for me 'n fise openings. The thimble is a constructed as to be figure attached to the chimary and is provided with preductions adapted on continuous and the contract of the chimary and is provided with preductions adapted to chimary and in provided with preductions adapted to chimary and the province of the chimary and the point provided adapted to the chimary and the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of th

pumpind wheneve facilited by turning it before with-drawing its from the thimate. A sight modification derive consists in attaching the stimule to the sight of the sight of the sight takes the pince of the ener of as well as the new 7, The stree pinc is provided with tongues which are underent, forming grooves in which the spikes are necessive when the pipe is given a partial turn. The



IMPROVED STOVE PIPE AND TRIMBLE FOR PLUE OPRILITIES

pipe is formed with a bend edapted to engage the finage B, which forms a next electron case the pipe does not perfectly fit the thimbia. When the pipe is withdrawn, the opening may be closed by means of a cot O, which is provided with grooves B. His those out O, which is provided with grooves B. His those the pipe. The investor of this store pipe and thingle is Mr., Ambroon Y. Medelirk, of Devagpert,

haust These bubbles are readily discornible, and indicats the course which is being pursued, thus enabling the enemy to take measures for dense or a counter attack. In order to prevent a submarine best from betraying its course in this way, an investor has devised a method of retaining the exhaust gases, per mitting them to escape only at irregular intervals in

Brief Notes on New Inventions, sence of a submarine boat is sometimes to

The presence of a submarine boat is sometimes made known to the enemy by the train of bubbles that rise to the surface of the water from the gas-engine ex-haust. These bubbles are readily discernible, and

The pre

UNIQUE CONCRETE PERCE POST

this quantities Although the single large gas bub-ble thus produced would indicate the position of the submarine, it would not give any information as to the direction in which it was traveling or its rate of speed direction in which it was traveling or its rate of speed The exhaust games of the engine are led to a gas puri-fer and coolor, and then earthed with oxygen and passed through the engine again, so that the engine works in a closed cycle of an automatic valve serves to carry out the gases, when they reach too high a pressure, and content them to a receptuale, whence they may be released by a hand-operated valve when ever desired.

has seen of fire, so the time-honored directions run, throw a mailress out the window and then jump down on it. As a mailress may not arbay be heavily, an inventor of this city proposes that fire companies be estupped with mattress invoke for the accommodation of lines who have been trapped in a burning building. He has invented a truck provided with a planteness and white, we relies of bed springs and mattresses and white, we relied to the springs and mattresses and white, we relied to the springs and mattresses and white, we relied to the condication heatist, say to the sevond-story windows, and moved inward toward to building so as to bridge over the areasway. The innates can then lesp from their windows to the mattress.

mattress
There is nothing a freman dreads more than a fire
which produces volumes of dense smoke, for it is im
possible for him to get near enough to the seat of the possible for him to get mar enough to the seat of the fer and to see clearly enough to direct the stream of water property Various devices to enable a firema-tion of the season of the season of the sort has just the total time. A novel scheme of this sort has just time to time. A novel scheme of this sort has just needed to a various control of the season of the precision of the season of the sort has pur-needed to a various control of the season of the precision of the season of the season of the precision of the season of the season of the precision of the season of the season of the precision of the season of the season of the warm by the freedam.

In the rubbing of such vegetables as superagus, in the rubbing of such vegetables as superagus,



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"forp title" the segre crack. The spate P is ownpetted to a pair of being crack. Which is true are consisted by parallel roles H Mounted to alike vertically on the rol H is a part I which sengage a rack on the curriage has a part I, which sengage a rack on the curriage his mored forward at each sparation of the pedal D to bring the crack and posterior of the pedal D to bring the crack and pedal pedal pedal pedal pedal pedal pedal pedal pedal pedal pedal pedal pedal pedal pedal pedal pedal pedal pedal pedal pedal pedal pedal pedal pedal pedal pedal pedal pedal pedal pedal pedal pedal pedal pedal pedal pedal pedal pedal pedal pedal pedal pedal pedal pedal pedal pedal pedal pedal pedal pedal pedal pedal pedal pedal pedal pedal pedal pedal pedal pedal pedal pedal pedal pedal pedal pedal pedal pedal pedal pedal pedal pedal pedal pedal pedal pedal pedal pedal pedal pedal pedal pedal pedal pedal pedal pedal pedal pedal pedal pedal pedal pedal pedal pedal pedal pedal pedal pedal pedal pedal pedal pedal pedal pedal pedal pedal pedal pedal pedal pedal pedal pedal pedal pedal pedal pedal pedal pedal pedal pedal pedal pedal pedal pedal pedal pedal pedal pedal pedal pedal pedal pedal pedal pedal pedal pedal pedal pedal pedal pedal pedal pedal pedal pedal pedal pedal pedal pedal pedal pedal pedal pedal pedal pedal pedal pedal pedal pedal pedal pedal pedal pedal pedal pedal pedal pedal pedal pedal pedal pedal pedal pedal pedal pedal pedal pedal pedal pedal pedal pedal pedal pedal pedal pedal pedal pedal pedal pedal pedal pedal pedal pedal pedal pedal pedal pedal pedal pedal pedal pedal pedal pedal pedal pedal pedal pedal pedal pedal pedal pedal pedal pedal pedal pedal pedal pedal pedal pedal pedal pedal pedal pedal pedal pedal pedal pedal pedal pedal pedal pedal pedal pedal pedal pedal pedal pedal pedal pedal pedal pedal pedal pedal pedal pedal pedal pedal pedal pedal pedal pedal pedal pedal pedal pedal pedal pedal pedal pedal pedal pedal pedal pedal pedal pedal pedal pedal pedal pedal pedal pedal pedal pedal peda



is automary to force the growth by covering the bods with giase. This is rather a tumbercose processor, the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the con

there is monther. Two interesting patents on drinking cups have retently leven issued. One of them provides a foldingpocket drinking cup, which constant of a piece of
firstline, waterproof material folded upon itself to form
a cup without any seems through which the water may
leak. The cup is convered by a strip of testher, and
read to the conveniently in the vest pocket. The
other cup referred to is adepted particularly for use
at wade foundiness and public dispusantive of beverages
It is formed of a band of paraffine paper connected by
ouverlapped joint. The bottom of the cup is made
out of a star-shaped bissis, the points of which are
out of a star-shaped bissis, the points of which are
to attach the bottom to the cup, but to resinderee it.
The cup is made of tapering form to permit of
meeting

neeting Mr Dezter M Rogers, of Boston, Mass, has dedicated to the public an insec-destroying bomb upon tions of the property of the property of the client dry policious in produced form, and is averaged to be exploded when it reaches a criain height after intended to the companies of the companies of him, discharged from a sun The policious parties in this distributed in the air, and gradually settle down on the leavase of the trees which are infaced with the linects. This method of treating the trees poseases the advantage that the powder will peach all parts of the follows, and is applied with a great parties of time and about of supplied with a great parties of time and about on the contract of the con-

PATENTED ODDITIES.

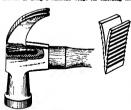
GUN BORN SHOUTHEN THE ARCOP.—A rather ingenismented of towling the sights of a gun has recently persecuted by a German inventor. It consists in place the telescope in the bore of the gun, with its limit



TELESCOPE FOR TRETIES GUN SIGHTS.

sight parallel to the axis of the bore. The sightly device is then set to its sero position, and the gun almost at a distant object. The evidence of the test scope, which is shown in the suberged sectional view, is fitted with a priem, so their the sait of sight intersects the lime of aim at the eye. In this way it to possible to make an observation by meetly moving the possible to make an observation by meetly moving the possible to make an observation to predict the possible to make an observation of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of th

ROSHING WESTER FOR TOST HANDLES—An inventor in New Mexico has recently hit upon the ingenious scheme of using a resilient wedge for fastening the



RESILIENT WEDER FOR PASTERINE TOOL BRADE,

heads of tools upon the headles, the advantage of this being that when the wood is compressed through the use of the tool, the wedge will expand, and thus autometically tighten the handle The wedge as illustrated herwith is split, and is provided on opposite faces with retchet teeth that serve to prevent its withdrawal from the wood. The tool head should also be formed with ratchet teeth inclined opportialy to those, or the wedge, so as to prevent the handle from being withdrawn.

withdrawn.

Am-Cocurse Fax—It is well known that the circulation of air increases the rate of evaporation, and thus cools a moist body It is for this reason that we use a fan to produce an artificial draught of air over the



ERLF-COOLING FAN.

face and absorb moisture from the skin. An inventor has recently hit upon the idea of improving the efficiency of the fan by providing it with a moist pad, so that the evaporation will cool the fan. The fan is made up of a rattan frame, as shown in the accumpanying drawing, which is covered with two layers of cioth, between which is a layer of felt. The cloth layers may be removed to permit of taking out the fall operated it will grow colder, by reason of the evaporation of the control of the control of the control of the control of the control of the control of the colder in the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the cont



MARROW WITH AUTOMATIC LIFTER.

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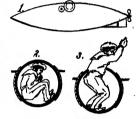
STUMP-SPLITTES—The usual method of removing stumps of trees from the ground is to split them by the use of a wedge or a blast of dynamits—The ac-



visions bearing provide seasons.

connections (the region of the connection of the

MOYED LIFE-SAYING HATCH FOR SUBMARINE BOATS.—When a submarine book has been disabled and sunk, the occupants dare not attempt to scape, for if the batch should be opened there would be an inrush of water,



LIFE-SAVING MATCH FOR SURMARINE BOATS.

which wentd drown the crew before they could ecope. An inventor has recently hit npen an idea, between the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the pro

and then with the water outside. To escape from the vessel, a man crawle into the hatch, as indicated in Fig. 2, and then it is turned around to the position shown in Fig. 3, permitting a limit to diver upward through the water and escape.

Best-Juner Passes—One of the best foods for invalide is the juice of rare bost, which is cut into fragments and pressed out by means of a small hand press. An inventor in France has recently devised a very simple press for this purpose, which allows of



### DEPROVED BREST-TORS PROME

expressing the John of a large afficials of best altima. The press is similar to the ordinary type, from formed of a criticale respirate, with it planager, which, it between the region of the planager of the introde down by a land, error, largest of the ordinary the primary for each piece of best the option is berauged to take, it suitable of larger of the depths is her separated by disary of correlated and perfugicies. The green in presents, with a special time, and have been been presented to the conlower. After the press of constant time, the largest many than the conlower, After the press of constant time, and have been the press of constant time, and have been the press of constant time.

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THE LIFE OF WILLIAM TROUBON, BAROT RESTREE OF LASSE. By Silvanus P. Thompson The volumes. New York and London. The Macmillan Company, 1840. Svc.; 1,887 pp. Price, 1780 etc.; 1,887 pp. Price, 1880 etc.; 1,887 pp.

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ed into a user-time at the instantion.

The instrument has also been anapted to other phases of work such as the electrophone and wireless telegraphy with similar success. In the former case and the success of the success irophone and wireless telegraphy with similar success. In the former case when the receiver is connected to a trum port the sounds are distributed through out the room, while in connection with other is begraphy it has enabled in pulses, which were so receive as to be undetected, to be picked up, and dis-tinctly read by the operator at some dis-tages round his instrument.

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(Continued from page 500.) Wright biplane before, it is safe to Wright biplane before, it is as to but mise that his cross-channel figer was one of the new, powerful Franch Wrights, with a double horisontal radder (a sur face in the rear added, which as in the Farmán machines, acts in unison with Parman machines, sour in unson what the front rudder? This is in accord with the Wrights tendency to increase the power of the controls to the highest possible pitch, and at the same time it acts somewhat like an automatic steadying device. Any surface in the

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A com parison of the catalogues of Harvard and Potedam shows differences in the recordad brightness of red stars if in or red star to that of a white star is repre red star to that of a white star is repre-sented by E, it will be represented in the other catalogue by 3/2E. These system atlo differences appear to be due to two distinct causes. The first source of error is purely physiological and consists in the fact that sensations of color are pro-duced by the excitation of the termina filaments of the optio nerve, which line the retina, and which are of three differ ent sorts, sensitive respectively, an ent sorts, sensitive respectively, and al-most exclusively, to rays of the red, the green, and the blue and violet portions of the spectrum. Now this relative sensi-tiveness varies greatly in different indi-utipals, as is strikingly illustrated by the entreste and pathological case of Dalora-lam, or color blindness. The luminous size, or color blindoses. The lumipous amination preduced by a given star, that is to say, the aggregate effect, impressed upon the filaments of the three different Ruha, differs in different individuals. The second cauty of error is found, apparently, in the phenomenon discovered by Parkinja, which may be expressed as a filament of the color of the color of the color of the color of the color of the color of the color of the color of the color of the color of the color of the color of the color of the color of the color of the color of the color of the color of the color of the color of the color of the color of the color of the color of the color of the color of the color of the color of the color of the color of the color of the color of the color of the color of the color of the color of the color of the color of the color of the color of the color of the color of the color of the color of the color of the color of the color of the color of the color of the color of the color of the color of the color of the color of the color of the color of the color of the color of the color of the color of the color of the color of the color of the color of the color of the color of the color of the color of the color of the color of the color of the color of the color of the color of the color of the color of the color of the color of the color of the color of the color of the color of the color of the color of the color of the color of the color of the color of the color of the color of the color of the color of the color of the color of the color of the color of the color of the color of the color of the color of the color of the color of the color of the color of the color of the color of the color of the color of the color of the color of the color of the color of the color of the color of the color of the color of the color of the color of the color of the color of the color of the color of the color of the color of the color of the color of the color of the color of the color of the color of the color of the colo generaty, in the phenomenon discovered or Publishes of Publishes of Publishes of Publishes of Publishes of Publishes. 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star and the aperture of the telescope Additional complications are introduced by the age of the astronomer, the position of his eye in respect to the eye the degree of ocular fatigue, etc. eliminates these errors in the determina n of the total luminosity of stars tion of the total luminosity of stars. It makes possible an exact study of the colors of stars and of the dispersion of light in interstaller space Finally, it will undenbiedly give information constrange and mysterious transformations of variable stars of all classes

A Morms-Warming Service for Aeronautz, Dr Franz Linke director of the Me-teorological institute of the Physika-lischer Verein at Frankfort-on the Man, has published a report on the special storm-warning service that he organized last summer in connection with the inter service, being the first of its kind, was exportmental, but proved so successful that a similar undertaking is likely to be a feature of all future aeronautical rompetitions on a large scale, especially if held in a region of frequent thund

The prediction of large general storms services that now exist in all civilized countries Local storms, however, and ospecially thunderstorms, are notoriously difficult to forecast on the basis of the widely scattered reports that make up the ordinary weather man and that are all that the forecaster ordinarily has at hls command The attention of the Frankfort service was directed especially to the prediction of thunderstorms. The life history of these storms is now well understood thanks to the hrilliant in vestigations of a small group of me-teorologists of whom M Durand-Gréville is the most conspicuous in the great majority of cases they sweep across the country in a long line that may be compared to the front of an advancing army

pared to the front of an advancing army
—the "thunderstorm front"—at a speed
averaging, in Europe, about 40 kilometers an hour The line of advance kerns
a position more or less parallel to itself,
and its progress is not difficult to predict, if its oxistence and position are known at any given time The prerequi-sites of successful thunderstorm predic-tion are a dense network of reporting stations and a system of adequate tele graphic communication with the central

five observers constituting a pickel line of 150 kilometers radius around the city of Frankfort. These were mainly reof Frankfort These were mainly re-cruited from among the volunteer ob-servors already reporting, but not by telegraph, to the existing meteorological institutes of Southern Germany. These persons were requested to send an 'ur-gent' telegram to Frankfort whenever a thunderstorm or a wind-squall (which is first-cousin to the thunderstorm) ap-peared in their vicinity between the hours of 7 A M and 7 P M The compensa-tion offered was a free entrance ticket to the exposition and a copy of the pub-lished results of the experiment

The result of these arrangements was most gratifying, as, with one or two exceptions, all the thirty-seven thunderstorms that reached Frankfort during the three months of the exposition were duly heraided an hour or more before their arrival

It is noted that no air-raft attempted to fly in the face of providence—and the weather forecaster—except the big Zeppelin," which began its famous voyage to Cologne against the advice of the foreaster and promptly ran into a heavy thunderstorm.

The entire cost of the service was only 600 marks (\$150), an insignificant amount compared to the value of a single large airship, to which, as well as to the lives of aeronauts, an effective stormwarning service accordingly offers a cheap form of insurance







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NEW YORK, JUNE 25, 1910.

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Hamilton's biplane traveling above and beside the locementive of the special train during the flight from New York to Philadelphia and return on June 18th.

THE LAYEST FORM OF RACING—[See page 521.]

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### THE OPEN DOOR OF AVIATION

dissilving the injunction granted in favor of the Wright brothers against Cuttles, by Indge Hazel and the summar injunction granted by Indge Hand against Paulban the Cheuft Court of Ap as als has simply followed a long established precedent or material has As a seneral rule prefinitions before tions are not countriumed in patent case even lower fellowals. The reason react ha to seek. Barely indeed as intringement so charts established that a court is fustified in restraining the minoriacture and use of an invention tefore the question of patent valid D preliminary injunctions were granted without entering into the question of validity many an house refinients linshings would be ripped mill after

The hardship which results from the great a read between to use therety tituatented by this very injunction which the Wrights obtained against and Latiben As a result of the interlocutory decrees and I-aillian. As a result of the interlocutory decrees of indiges Hand and Haze'the Wright brothers have controlled flying in this country for the last six months. Unless he filed a bond with the court, no aviator who used a machine equipped with alterous or wing warping devices operated in conjunction with a vertical radder could make sell or fi) his appa-cution in this country. It is far from our intention to censure the Wright broilers for the attitude which they have taken. They are in every way justified in seeking to uphoid their patents and in defending tights which unestablished as they are as yet from a legal point of view are nevertheless the truit of pains. legal point of view are nevertheless tha fruit of pains-nking experiments extending over years. Probably the counsel of the Wright brothers themselves were as much astonished by the willinguess of Judges Hand and Hasei to grant injunctions against Curthes and Paulhan as the patent profession at large Curties at least was a successful sylator before the Wright brothers decided to (sat saids all secree) and to show the world what manner of machine was that of whose performances they had darkly hinted Biériot, too, had been pluckily experimenting for some time before the Wrights flew in public Curiss was using hinged wing tips in his earlier machines with which he made public flights antedating the open flights of the Wrights. It is asionishing that the lower court should have failed to find in these facts a sufficient onflict of evidence to deny the granting of an in

With the reversal of the decision of the lower co by the Circuit Court of Appeals, the develop a lation in this country is now unhampered I Sommer, Biériot De Lesseps, and the rest daring company of French serial pilots, whose an ploits entiren the press dispatches simost every day, are now at liberty to enter this country and fly without the fear of finding their hands and their machines ried by a sweeping injunction Moreover, American inventors will have the opportunity of improving exinventors will have the opportunity of improving ca-leiling machines provided with wing warping devices, without fear of incurring a fine for contempt of court Much as we should like to see justice done to tha Wrighls, we cannot but feel that the reversal of an injunction granted contrary to established precedents will be viewed with satisfaction by every aar

THE SCIENTIFIC AMERICAN ARRONAUTICAL TROPHY. PART from the value which will attach to the Schwiff Ampsicat seronautical trophy as indicating that its permanent owner has in three different years made the longest flight in the United States, the trophy will possess a strong historical and sentimental interest as being absolutely the first prize of any kind offered in America for the encouragement of the art of aviation.

in this respect the trophy must forware be using among the counties cups and prises which will be offered in increasing sumbers during the years to come Cups which are won year by year for certain special events and pass into the permanent owner ship of the whomer possess a valua and interest which, however great at the time, must necessarily become local and personal as the years po hy, but a trophy which carries the distinction of being the first to be offered in that early period of doubt and strength which have a beginning to the contract of the which have a beginning the contract of the con-tract of the contract of the contract of the con-cess a value at it were which will inertiably increase. sess a value all its own, which will inevitably increase e ispse of time

in this connection, we wish to draw the attention of intrants for the forthcoming long-distance, cross-com try flights, for which such generous prises have been offered to the fact that upon their sending a letter of notification to the Aero Club of America their Pights will needed official recognition and if the dis-lance covered should be greater than the seventy to sevent) five miles (official distance now under consid intian) flown by dir Curtiss between Alb Pongbles ask, that contestant unless lits record sh is surpassed before the close of the year will be the close of the year will be the close of the year will be the strance fee or expense of any kind attached to such un cutty the sending of a letter similar to that by Mr Culles which was published in the Still title Animax of Inne 10th 1910 being all that is neces

We wish moreover to take this opportunity of cor ecting the rather with spread impression that the cup must be won three years in succession. As a matter of fact there is an stipulation of this character tild If a contestant wina the cup three



## THE INTERNATIONAL UNION FOR CO-OPERATION IN SOLAR RESEARCH

F a scientific critic were called upon to mantion one of the most striking and important features of modern astronomical research it is quite likely that he would refer to the apirit of organised and practical cooperation which is manifested by observatories and astronomers. By evolving anitable plans for joint efforts to enable each institution to do plans for youte source to enable such institution to do the work for which by equipment and position it is best suited, and by assigning through common agree-ment the particular part to be played in any given campaign, increased efficiency is secured, uncleas dupil cation is prevented and the entire project under prose-cution can be advanced symmetrically and rapidly. rution can be advanced symmetrically and rapidly. The photographic chariting of the heavens, the obser-vation of transits and total solar cellipses, the study of the variation of latituda, and the investigation of the shape and mass of the earth, are a few familiar instances of valuable cohperative effort by astron-

More recently there has been an attempt to secure similar harmony of effort and coliper a similar harmony of effort and coliperation in the atudy of the aun, and in 1904 at the initiative of Prof. George E. Hala, director of the Mount Wilson Solar Observatory of the Carnegia Institution of Washington, there was formed among the visiting astronument at the St. Louis Exposition an International Union for at the St. Louis Exposition an International Union for Coloperation in Iolian Research. In this following year this Union met at Oxford, and in 1907 at the observation of Mendon in France. This Payer, on Appara 59th, the members of the International Union will assemble at Mount Wilson, California, as the greets of Prof. Hale and the Soine Poservatory of the Garnegie Institution. This meeting aboutd prove Unique and measurable, for it may be doubted whither there have seve been assembled so many eminent entropements astrophysicists interested in solar studies as the who have accepted the invitation for the Nounb Will

conference: That such a indirectar in farmily presented out the fellocates allevious to seize solution of the fellocates allevious to seize solution of Prof. light and the sharevering? the direction will be admissed be despited, but of it time these distinguished servonemers and ph will be said to searching the timestree this that institution and its novel and powerful instrum se of which several new chapters in our in of solar phenomena have been written and still other iscoveries, especially in the field of stellar evolution com destined to follow

removed to follow the control of the visiting scientists who never better have made the pligrimage from Passdean up the alopse of Mount Wilson the work of the Solar Observatory is familiar from accounts published in acientific pariodicals. No one is more welcome before European astronomical societies than its distinguished director, who whenever abroad is siways called upon to describe its progress Therefore, it is not aurprising that when the opportunity was afforded, some fifth representatives of important astronomical observa ies and his sical interatories should decide to cross the Atlantic Ocean and the American continent to see and hern at first hand of work in which they are intimately interested. While it is a source of intenses gratification to Americans that the Mount Wilson Or-severatory has become so pre-eminent in the brief space of aunu six vears, yet it must be remembered that colar astronomy and astrophysics are presecuted with viscor at other institutions and by numerous astronom it is this circumstance that makes of importance the coming meeting of the International Union

The value of solar work may be appreciated when it is slated that the dry season at Kodaikanai in Southern india where there is maintained a large ob-Wison when of course the regular daily photographing of the sun is out of the question. With proper animpements therefore, it, is possible to obtain a conlinuous photographic record of solar phenomena from one stallow or another on the earth's surface Likewise tin visual observation of the sun-spot spect is definitely apportioned among various observers, so that each group receives a portion of the spectrum for thorough simily, the results of the various observations being recorded on a common plan Again, so impo in modern solar research has become the use of spi heliograph whereby the sun's surface or limb is photo-graphed in light of a single wave-length, according to certain deficite arrangements, that there is now an important chain of observatories from India across Europe and America to the Pacific Coast, where these Birrope and America to the Pacific Coast, where these instruments are in daily use. To record the amount of the sun's radiation received at the earth's surface, bolometers and other heat measuring davices are ployed at various stations and continuous records are ployed at various stations and continuous records are ployed at various stations and continuous records at kept. In many case it is quite obvious that local conditions may affect the observations and the records. Accordingly there must be almultaneous observations at a number of stations authorities over as long periods at a number of stations authorities over as long periods. of time as possible. These are being secured with ever greater efficiency by the members of the International Union for Cooperation in Solar Research. h cooperative action is not intended to destroy insuch conjecture action is not infended to destroy in-tituitive or originality in any observatory or nation-omer, but rather to encourage it. To-day a large number of observers are engaged activaly in solar research, and in no dapartment of astronomy is a greater amount of progress being made. This is all the more striking as it was only a few years all the more stricing in the stricture of the stricture of the sun had almost been relegated to that limbo from which nothing new can sver come

Some interesting communications relating to the general study of the aarth were presented to the International Geodetic Association, which me in Incode to the September, 1909. The values of the obtatement and the equatorial glanteer which have been deduced from the triangulation established by the U. S. Const. Geodetic Const. Const. Const. Const. Const. Const. Const. Const. Const. Const. Const. Const. Const. Const. Const. Const. Const. Const. Const. Const. Const. Const. Const. Const. Const. Const. Const. Const. Const. Const. Const. Const. Const. Const. Const. Const. Const. Const. Const. Const. Const. Const. Const. Const. Const. Const. Const. Const. Const. Const. Const. Const. Const. Const. Const. Const. Const. Const. Const. Const. Const. Const. Const. Const. Const. Const. Const. Const. Const. Const. Const. Const. Const. Const. Const. Const. Const. Const. Const. Const. Const. Const. Const. Const. Const. Const. Const. Const. Const. Const. Const. Const. Const. Const. Const. Const. Const. Const. Const. Const. Const. Const. Const. Const. Const. Const. Const. Const. Const. Const. Const. Const. Const. Const. Const. Const. Const. Const. Const. Const. Const. Const. Const. Const. Const. Const. Const. Const. Const. Const. Const. Const. Const. Const. Const. Const. Const. Const. Const. Const. Const. Const. Const. Const. Const. Const. Const. Const. Const. Const. Const. Const. Const. Const. Const. Const. Const. Const. Const. Const. Const. Const. Const. Const. Const. Const. Const. Const. Const. Const. Const. Const. Const. Const. Const. Const. Const. Const. Const. Const. Const. Const. Const. Const. Const. Const. Const. Const. Const. Const. Const. Const. Const. Const. Const. Const. Const. Const. Const. Const. Const. Const. Const. Const. Const. Const. Const. Const. Const. Const. Const. Const. Const. Const. Const. Const. Const. Const. Const. Const. Const. Const. Const. Const. Const. Const. Const. Const. Const. Const. Const. Const. Const. Const. Const. Const. Const. Const. Const. Const. Const. Const. Const. Const. Const. Const. Con and the equatorial planeter which have been deduced from the bringinghalon established by the U. S. Chest and Gedetic Survey agree closely with the values do-thind from Enopean surveys. Pred. Rovers sphilled a townion balance which registers variations of the control balance which registers variations of the planeter of the planeter of the planeter of the planeter of the planeter of the planeter of the planeter of the planeter of the planeter of the planeter of the planeter of the planeter of the planeter of the planeter of the planeter of the planeter of the planeter of the planeter of the planeter of the planeter of the planeter of the planeter of the planeter of the planeter of the planeter of the planeter of the planeter of the planeter of the planeter of the planeter of the planeter of the planeter of the planeter of the planeter of the planeter of the planeter of the planeter of the planeter of the planeter of the planeter of the planeter of the planeter of the planeter of the planeter of the planeter of the planeter of the planeter of the planeter of the planeter of the planeter of the planeter of the planeter of the planeter of the planeter of the planeter of the planeter of the planeter of the planeter of the planeter of the planeter of the planeter of the planeter of the planeter of the planeter of the planeter of the planeter of the planeter of the planeter of the planeter of the planeter of the planeter of the planeter of the planeter of the planeter of the planeter of the planeter of the planeter of the planeter of the planeter of the planeter of the planeter of the planeter of the planeter of the planeter of the planeter of the planeter of the planeter of the planeter of the planeter of the planeter of the planeter of the planeter of the planeter of the planeter of the planeter of the planeter of the planeter of the planeter of the planeter of the planeter of the planeter of the planeter of the planeter of the planeter of the planeter of the planeter of the planeter of the planeter of the planeter or a man day. The variance means two derings of the theoretical amplitude and first the dering at a whole, a rigidity comparable with that of greet. The reminishment to destroyments—in givenity, in sign man will wone than in a short, and south direction. This off-forence to probably caused by the entitle requirem.

## Scientific American

### ELECTRICITY.

Expensible that gland a submarked of the Language is submarked to the bad of the country of the second of the country states in the second of the country states are a second of the country states are a second of the country states are a second of the country states are a second of the country states are a second of the country states are a second of the country states are a second of the country states are a second of the country states are a second of the country states are a second of the country states are a second of the country states are a second of the country states are a second of the country states are a second of the country states are a second of the country states are a second of the country states are a second of the country states are a second of the country states are a second of the country states are a second of the country states are a second of the country states are a second of the country states are a second of the country states are a second of the country states are a second of the country states are a second of the country states are a second of the country states are a second of the country states are a second of the country states are a second of the country states are a second of the country states are a second of the country states are a second of the country states are a second of the country states are a second of the country states are a second of the country states are a second of the country states are a second of the country states are a second of the country states are a second of the country states are a second of the country states are a second of the country states are a second of the country states are a second of the country states are a second of the country states are a second of the country states are a second of the country states are a second of the country states are a second of the country states are a second of the country states are a second of the country states are a second of the country states are a second of the country states are a second of the country st Spirit, which with inverse to the bed of the cosm is justic about two miles from Inad. The ball is con-lement by cable with the lighthouse, from which it still be opened. "It is matterpared that mess exam-tor jumping sis the Channel all approach the Limre, the ball will be of great ambiance to them, particu-lately in time of tog.

skety in time of rog. Wey gratifying it the steady growth in efficiency of the successive submarines which are being tried out for the United States may? The "Skilmon," built at this fruck Stree yards and designed for 11 knots at the surprise and job innote submerged, established last steath a surrane record of 18/6 knots, and a record labely the surrance of 18/9 knots. Four corputors, discharged when the slop was at full speed in the submaringed condition, accord what was protoclastly a

spires of bulls-eyes.

B is reported by the Engineering Agency of South
Affris, Johannesburg, that an important body of iron
ee, has been found in Natal, Whith thirty miles
she hard been found in Natal, Whith thirty miles
she halfway and within seventy five. miles of the coast.
Almestone has been incosted in large quantities at
distance of only a mile from the over Edy, and cooking,
the sheet of the coast. Exmessions has been located in anys quantities at a distance of only a mile from the ore Body, and coking soal has also been discovered in Natal In view of the fact that the River Tagala, which is satisfale for the development of hydro-electric power, runs through this iron ore property, it is likely that the new full but tread to immediate commarcial account.

will be turned to immediate commercial socious.

The resorved of the twate-year-old, 20-story Gillender Building at Wall and Nassau Streets in this
city is certainly a record in house-wrecking. The time
allowed was 45 days at a price of \$50,000, with a ablowed was 46 days at a price of \$6,000, with a penalty of \$500 for every day exceeding that period. The work will be done within the specified time. The most difficult work has been the removal of the brick backing of the outside stons work. The steel frame was taken down, pleec by piece, by knocking off the heads of the trivets and driving the latter out with a dritt; pin The steel work will be available for other construction

The system of transmitting train orders in this country by the telephone is making rapid strides. Statistics filed by the interstate Commerce Commission show that the telephone is being used for this purpose on tice field by the interstate Commerce Commission show that the telephone is being used for this purpose on 335 roads in the United States, on which 36,344 miles of road are operated by this method. On ten of the roads telephone dispatching covers 500 pulles or more, react telephone dispatching covers slobynites or more, and on fire roads the distance covered exceeds 1,000 miles, this being the case on the Atchison, Topaka & Sants W9, the Chicago, Burlington & Quincy, the Great Northern, the Illinois Central, and the Pennavivania Railroad.

sylvania Railrond.

The, Berges tunnal under Jersey City Heighta, through which for forty years all passengar trains on the Erife Railrond have boen run, will be abundoned on July lat for passenger service, and will be given over wholly to the movement of freight. After that date passenger trains will make use of a great openar four-train cut, upon which the contractors have ants passenger trains wis make use or a great open-sir four-track cut, upon which the contractors have been at work for the past three years. The cut, which extends for 4,400 feet through the Heights, is 58 feet axtands for 4,400 feet through the Heights, is 88 feet wide at the bottom, and varies from 45 to 85 feet in depth. It is intersected by four tunnels, whera the material has been left in place to carry the streets above, but none of these is of greater length than an

In a recent fire test of the reinforced concrete floor of a tall building, the following excellent results were obtained. The floor panels measured 32 feet by 20 feet, center to emter of the commun, and they were required center to center of the ordinane, and thay were required to stand a test load of 500 pounds per square to the stand a test load of 500 pounds per square to with a deflection not above three-parters of an inch. In the test, the deflection under this load was only one-sighth of an inch. With a hot fire beneath the foot, there was an increased deflection of 1% inches. Water from a fire hose was then directed against the bottom of the now heated concerts, when the foor ross serwa-dighths of an inch, heaving one and one-burister of an inch deflection. This test, it should be understood, was made of a flooy in the completed helifales.

briffeling. The New Herms and Hartford Railroad have received from the Westlandsones Company a new Harbinshouse Company a new Harbinshouse Company a new Harbinshouse Company as the American State of the Harbinshouse Company and Harbinshouse Company and Harbinshouse Company and Harbinshouse Company and Harbinshouse College for a long-lett the control of the Harbinshouse College for a long-motive which could had a 12-bin-in Display tends of a speed of 48 miles as house on large longs, where his tends next incompanie was not seen the 12 fireging and 1941. The Montantire rape calls to be a speed of 1941 in the long-motive rape calls to be a speed of 1941 in the long-motive rape calls to be a speed of 1941 in the long-motive rape calls to 1941 in the long-motive rape calls to 1941 in the long-motive rape calls to 1941 in the 1941 in the long-motive rape calls to 1941 in the long-motive rape calls to 1941 in the long-motive rape calls to 1941 in the long-motive rape calls to 1941 in the long-motive rape calls to 1941 in the long-motive rape calls to 1941 in the long-motive rape calls to 1941 in the long-motive rape calls to 1941 in the long-motive rape calls to 1941 in the long-motive rape calls to 1941 in the long-motive rape calls to 1941 in the long-motive rape calls to 1941 in the long-motive rape calls to 1941 in the long-motive rape calls to 1941 in the long-motive rape calls to 1941 in the long-motive rape calls to 1941 in the long-motive rape calls to 1941 in the long-motive rape calls to 1941 in the long-motive rape calls to 1941 in the long-motive rape calls to 1941 in the long-motive rape calls to 1941 in the long-motive rape calls to 1941 in the long-motive rape calls to 1941 in the long-motive rape calls to 1941 in the long-motive rape calls to 1941 in the long-motive rape calls to 1941 in the long-motive rape calls to 1941 in the long-motive rape calls to 1941 in the long-motive rape calls to 1941 in the long-motive rape calls to 1941 in the long-motive rape calls to 1941 in the long-motive rape calls t

B has been proposed that the surplus water from the canal locks at Lockport be utilized to generate current which may be employed in lighting the Eric Canal from the Tonawandas to Albion Surely the advantages such a system would offer would well repay the cost of installation and maintenant

the cest of installation and maintenance.
An electric coulde has been laid in Oneida Lake
connecting Frenchman's lakand with the maintant
free distance in a little over a mins. The cable is to
conduct current at 6,600 voits to the slain, where it
will be stepped down to 110 voils to be used for
lighting the parillons and nunessenst apparatus of
the resort. This is said to be the first inng-distance, dension submarine cable ever laid

The United States Senate has passed the hill intro The Dated States Seasts has passed the bill intro-duced by Senator Depen governing wricess teleg-raphy it requires that all wireless stations secure Homese-from the Department of Commerce and Labor The bill aims to prevent interference of mresages and the sending of fulse distress signals and gives the raphy army and navy messages the priority over

Presence years wireless talegraph experiments have been conducted by Dr Frederick II Milliser for the second test of the presence of the presence of the second testable in wireless testing the second testable in wireless testing the second testable in which the presence of the presence of the presence of the presence of the presence of the presence of the presence of the presence of the presence of the presence of the presence of the presence of the presence of the presence of the presence of the presence of the presence of the presence of the presence of the presence of the presence of the presence of the presence of the presence of the presence of the presence of the presence of the presence of the presence of the presence of the presence of the presence of the presence of the presence of the presence of the presence of the presence of the presence of the presence of the presence of the presence of the presence of the presence of the presence of the presence of the presence of the presence of the presence of the presence of the presence of the presence of the presence of the presence of the presence of the presence of the presence of the presence of the presence of the presence of the presence of the presence of the presence of the presence of the presence of the presence of the presence of the presence of the presence of the presence of the presence of the presence of the presence of the presence of the presence of the presence of the presence of the presence of the presence of the presence of the presence of the presence of the presence of the presence of the presence of the presence of the presence of the presence of the presence of the presence of the presence of the presence of the presence of the presence of the presence of the presence of the presence of the presence of the presence of the presence of the presence of the presence of the presence of the presence of the presence of the presence of the presence of the presence of the presence of the presence of the presence of the presence of the presence service by storms

This breather of the rapid improvement in metal lamp filaments is the recent decision of the Chicago Rail way Company to install tantalum lamps on all new cars and carn that have to be rebuilt Before arriving at this decision, a terios of tests was conducted,



of high potential lines would be greater than the chance of a shock from secondary of 240 to 300 volts. For this reason, the recommendation regarding oir enits of more than 150 voits was withdrawn

cults of more than 150 votts was withdrawn Mow that the thunder storm season is hore, the Denver City Transway Company is instruction; its emptoyes in the sacets method of vanning their act during a storia. The metarmess are ordered to led the care coast as much as possible, so that in case a media possible, no that in case or would not be so liable to rinjury. The motormes are size instructed to note, if possible, the position of the controller hands when the err is strate by thickning. If the current were off, the injury would probably be confined to the controller hands when the err is strate by thickning. If the current were off, the injury would probably be confined to the controller box. Otherwise it might damage the motors, or it might burn off the trolley wire at the base of the trolley point at the base of the trolley point at the base of the trolley point at the base of the trolley point at the base of the trolley point at the base of the trolley point at the base of the trolley point at the base of the trolley point at the base of the trolley point at the base of the total point. nushed back to the barns.

pushed back to the barns. Profess the variety of the barns and the barns the variety of the barns and the variety of the barns and the variety of the variety of the variety of the variety of the variety of the variety of the variety of the variety of the variety of the variety of the variety of the variety of the variety of the variety of the variety of the variety of the variety of the variety of the variety of the variety of the variety of the variety of the variety of the variety of the variety of the variety of the variety of the variety of the variety of the variety of the variety of the variety of the variety of the variety of the variety of the variety of the variety of the variety of the variety of the variety of the variety of the variety of the variety of the variety of variety of variety of variety of variety of variety of variety of variety of variety of variety of variety of variety of variety of variety of variety of variety of variety of variety of variety of variety of variety of variety of variety of variety of variety of variety of variety of variety of variety of variety of variety of variety of variety of variety of variety of variety of variety of variety of variety of variety of variety of variety of variety of variety of variety of variety of variety of variety of variety of variety of variety of variety of variety of variety of variety of variety of variety of variety of variety of variety of variety of variety of variety of variety of variety of variety of variety of variety of variety of variety of variety of variety of variety of variety of variety of variety of variety of variety of variety of variety of variety of variety of variety of variety of variety of variety of variety of variety of variety of variety of variety of variety of variety of variety of variety of variety of variety of variety of variety of variety of variety of variety of variety of variety of variety of variety of variety of variety of variety of variety of variety of variety of variety of variety of variety of v

#### SCIENCE.

Prof. 2. 3. Bernard informs us that on June 6th he obtained a very good photograph of Hallay's comet. The plate showed the tail drifting off into space, and a new one forming in a different direction

The collection of fresh-water sponges of the U S National Museum is now being critically examined by Dr Nelson Annandale, superintendent of the Indian Dr Neison Annandals, superintendent of the Instan Museum in Calcutta, who is an accepted authority on this subject. Under the title of "Description of a New Species of Spongilla from China" there has just been issued paper No. 1737 of the Proceedings of the L S National Museum In this publication Dr Calcutte. Annandale describes as new Spongilla (Stratospon-gilla) signates which appears to be allied to Spongilla aspinosa Potts from which however it differs in its compact structure and lack of fiesh spicules. This specimen was found on rocks in the capel in southern Kiang Su, near Shanghai, China The type is in the collection of the U S National Museum

Prof. Negro of the University of Boulogne, has studied the radio-activity of dew The precipitation was made on glass plates exposed in immediate con-tact with the soil for several hours, beginning at about eight o'clock in the evening it is interesting to note that the water vapor was deposited entirely on the surface turned toward the ground while the opposite surface was quite free from any trace of moisture. From Negro's experiments it would seem that, as in the case of snow and rain, the activity of daw disappears atmost entirely in a very short time, which may be placed at not much more than half an caw disappears atmost entirely in a very short time, which may be placed at not much more than half as hour. The maximum radio-activity is detected not immediately after the introduction of the pietos into an electro-static apparatus, but some minutes after-wards, in which respect it differs from snow end rain

wards, in which respect it differs from snow end rain to noe of the Loopotchial workings a blower of inflammable gas has been insuring at depth of 1,500 feet, since August 1904. The gas consists \$15,500 feet, since hordeling noon and belium. The belium greatly preponderates over the near hard the two topscher form about 0.17 pr. cert of the original gas, or meany 1 per cent of the sax since removal of this particular to the control of the proposed properties of the sax since the horder was gas and hor calculated that a feast 13 cubic maters of the above gases have recaped since at the holium to the derawfatton of radium saits the horder was tapped. He stituthest the existance of the helium to the derawfatton of radium saits originally contained in the water of the sea which originally contained in the water of the sea which originally contained in the water of the sea which originally contained in the water of the sea which water, the equivalent congress having disappeared in conventing ferrous into ferric saits in the carmaitte.

We August Mechael Clark as accounted authority on

Mr. Austin Mohart Clark, an accepted authority on crinoids, has recently published two papers in the Proceedings of the U 8 National Museum The first of these papers, No 1740, is "On the Origin of Cer-tain Types of Crinoid Stems" and in which he dis-cusses the probable relationship between the column climates the processor relationship between the columns of the crinoid and the central or sur-anal plate of the schinoid, and how widely different types of columns may be reduced logically to a primitive common ancestor Among his conclusions from the evidence he presents is that the stems of the recent and most of the fossii crinoide may be derived by supposing them to be the homologue of the central plate of the crinoid echinoid ancestor which has graduelly become thickened and elongated and developed fransverse alternat ing fractures which have metamorphosed into definite articulations. The second paper No 1743 bearing the title "A New Australian Crinold," is a description of a new species which he calls Compson tra la and which was obtained at Port Jackson, New Waies, by Mr J Bracebridge Wilson in the summer

The late Prof Garriott, of the U S Weather Bureau was working at the time of his recent sudden death on a very promising method of long range forcessing, based on the observation of departures from normal pressure in which separate regions of the world Telegraphic reports of the pressure at European and Astatic sations are received every morning in Wash-ington, and wave mittiesd for this purpose. The study of 'correlative meteorology—1 o, the interrelations of atmospharic phenomena in parts of the world far remote from ona mother—is now occupying the seri-cua attention of meteorologists in all countries, and is one of the two satient features in the recent develwas working at the time of his recent sudden death on attention of meteorologists in all countries, and is one of the two anient features in the recent devel-opment of their science, the other being the expira-tion of the amoughney by means of kites and balloom. An international commission was recently organised, note the presidency of M Lodo Pisserence for for the purpose of maintaining a world-wide tel-tor the purpose of maintaining a world-wide tel-tor. The purpose of maintaining a world-wide tel-tor that the foreign of the commission can be realized, the foreign of the commission can be realized, the foreign expiration of the com-ditive without many semi-recinit the whole world, instead daily weather map embracing the whole world, instead a single country.

# MODERN STEEL LOCK BAR PIPE CONSTRUCTION

BY FRANK C. PERKINS

In considering the use of steel pipe as compared with cast from pipe, it should be remembered that they value of water pipe depends on carrying superior, strength and durability as well as cost The accompanies illustration Fig. 3, above 45 limb lock har pipe lying in a trench at Philadelphia, Pa., while the details of construction are noted in Fig. 3 it is held that the cost is about 5 per cent more than riversid that the cost is about 5 per cent more than riverside. pipe, but it has greater strength and carrying capacity

it may be stated that this capacity depends on friction, and riveted pipe presents an obstruction at er rivet and every circular and longitudinal seam.

rivet and every circular and longitudinal seem. It is also claimed that the uniform section of the lock bar pipe without any obstruction of any kind from end to end of each length of pipe, materially reduces friction. Some engineers say the carrying capacity of lock bar pipe is from 10 to 18 per cent greater than riveted pipe or is equal to well-coated, veil laid iron pipe
Tests on 30 inch pipe at Lockport, N Y, in 1909,

Treas on authen pipe at Lockport, N Y, in 1999, aboved a friction loss less than that given by Wat son's Tables for cast-fron pipe It is well known that steel pipe is materially stronger than cast fron pipe During a cloudburst in 1903, two 48 inch rivated steel pipe lines carrying 50,000,000 gallons per day for Newpipe lines carrying 50,000,000 gallous per day for New-ark, N J, were undermined and left unsupported for four days for over 35 feet, and in addition to the wight of the pipe and the water passing through them (about 15 tons), there were some thirty up-rored trees piled up over the pipe which supported this immense weight and pressure, without damage. It is conceded that cast iron is brittle and treach

crous at best and though apparently sound one day, may prove defective the next, and break without a oment's notice

It is of course true that the strength of any steel



Fig. 8.—LOCK BAR STREE FIFE, TAPER JOINT.



Fig. 1.—LOCK BAR PURE OF INCIDED DIABETER IN

pipe is equal to the ptryingth of the joints. Bingle riveded joints have an effective of about 16 per cost, double riveded joints about 65 per cost, triple riveded double, buttering joints about 65 per cost, and welded double, buttering joints about 86 per cost, and welded joints about 86 per cost. Lock har joints have a effecting of 100 per cost, and have greater strength. than pintee themselves, as all touts result in a fallers than piates themselves, as all tests result in a fullers of the plate, Without injury to the joint. A 48-hah diameter 7/14-inch plate lock her pipe was tested to 1.669 pounds pressure, and the metal of the plate was stretched 4½ inches with neither injury to the lock her joint nor the least testage along the same. Fur-ther pressure was impossible, because of the blooking out of the rivesed reinforcing and at the land and

out of the rivette removes.

It is maintained that look har pipe is from \$0 to \$0 per cent stronger than riveted pipe and 10 per cent stronger than velocity pipe, and superimon has shown at the per cent stronger than welled pipe, and superimon has shown and ind is fully equal to that of east-from pipe.

Without donkt the life of all metal is less than it was twenty years ago, an ownskays electrolypia, at phorous send, galvanie action and other squate greatly excelerate correction. It is therefore most difficult to compare the life of pipe laid within the last twenty years and pipe laid prior to that time, because of these constantly increasing corrective influences.

According to experiments on the reception of radio-telegraphic signals when transmitting with a spark gap in compressed air, as compared with signals re-ceived when an ordinary spark gap was used, there appears to be no advantage in using compressed air for this purpose. While the dielectric strength or the air is emormously increased, so also is the resist-ance to the cellilatory spark, both appearing to in crease in about the same ratio.

# THE WEARING OH

Manganess steel is by no means a new material, but its application has been slow because of the diffi-culties which manifest themselves in giving its final form. It seems to have been discovered by Hadfold's Relei Foundry Company, Sheffold, Regiand, some direct or forty years ago, when seeking a hard and cough substitute for steel when used for catchings it was found that the mere increase of carbon in the steel did not have the desired affect. Steel having a carbon content as high as 2 per cent structure of the steel was increased with the steel and the steel was increased. fully tried it was known that when the manganese content of a steel somewhat acceeded 376 per cent, the alldy would be brittle. What was not known and what the Hadfield Company found out was that if the manganese were increased to a point ranging any where from 7 per cent to 20 per cent a steel might be produced which is remarkably strong and tough be produced which is remarkably strong and tough Now this reversal of a leading property of an alloy by merely increasing the proportion of one of its con stituents is, as R A. Hadfield pointed out, not with In forming alloys of copper as the resultant alloys seem to become harder and more

the resultant alloys seem to become harder and more brittle as the time contain rises from a low point up to a considerable percentage say 35 per cent, but when more the is present than the soft and fough copper, the alloy becomes softer. It was early found, however, that manganese steel was a vory retractory metal to machine. The proper ties of hardeness and toughness produced a combination that was very successful in resisting the cutting of the contract of the combination of the combination of the combination of the combination of the combination of the combination of the combination of the combination of the combination of the combination of the combination of the combination of the combination of the combination of the combination of the combination of the combination of the combination of the combination of the combination of the combination of the combination of the combination of the combination of the combination of the combination of the combination of the combination of the combination of the combination of the combination of the combination of the combination of the combination of the combination of the combination of the combination of the combination of the combination of the combination of the combination of the combination of the combination of the combination of the combination of the combination of the combination of the combination of the combination of the combination of the combination of the combination of the combination of the combination of the combination of the combination of the combination of the combination of the combination of the combination of the combination of the combination of the combination of the combination of the combination of the combination of the combination of the combination of the combination of the combination of the combination of the combination of the combination of the combination of the combination of the combination of the combination of the combination of the combination of the combination of the combination of the combination of the combination of the c bigs-speck steem capable of enormous performance when used against the pure carbon steels and east from. But manganese steels still hold out. Almost the only practicable thing to do is to use the grinder. Now the grinding machine is of late become a strong complettor of the ordinary machine tool. But its development has hardly been carried far enough to stable ment has hardly been carried far enough to enable it to handle commercially the multiplicity of cutting constitutes necessarily operations necessary to enable manganess steel to have a general application to all the purposes for which it is highly adapted. Further, it has been found

difficult to roll
But sò great are the intringic capabilities of this
neaterial for certain uses that, in apite of the difficulties of giving it the dearfer form, it has been parity
rapidly acquiring friends. Consider, for example, the
case of the Borton Hersted Railway Company This
corporation operates its transportation gystem on a





wing extraordinary wearing qualities of mangazese strei rails.



This carre has the small radius of \$5 feet. PARE STREET CURVE OF THE MOSTON BLEVATED BALLWAY OF WRICE RECEIPT'S WEAR OF BASEA SOUTHER.

## NGANESE STEEL

others have radii between 100 and 110 feet. Boon article operation began, these in charge became in Present with the fact that an encrosson destruction been actually between the company of the company of the company of the company of the company of the company of the company of the company of the company of the company of the company of the company of the company of the company of the company of the company of the company of the company of the company of the company of the company of the company of the company of the company of the company of the company of the company of the company of the company of the company of the company of the company of the company of the company of the company of the company of the company of the company of the company of the company of the company of the company of the company of the company of the company of the company of the company of the company of the company of the company of the company of the company of the company of the company of the company of the company of the company of the company of the company of the company of the company of the company of the company of the company of the company of the company of the company of the company of the company of the company of the company of the company of the company of the company of the company of the company of the company of the company of the company of the company of the company of the company of the company of the company of the company of the company of the company of the company of the company of the company of the company of the company of the company of the company of the company of the company of the company of the company of the company of the company of the company of the company of the company of the company of the company of the company of the company of the company of the company of the company of the company of the company of the company of the company of the company of the company of the company of the company of the company of the company of the company of the company of the company of the company of the company

# THE CONTAGIOUS DISEASES OF METALS

THE RESEARCHES OF PROP. ERNEST COHEN

It has been known for some time, and probably even fin satisfully, them meals are mybele to dissease. For extending the satisful them to them to the satisful them to them to measure have brown strated, moreover, the contagious majors of such disease that is to may, a piece of diseased metal the beauty of them to the satisful to the piece of the satisful to the piece of the satisful to the piece of the satisful to the piece of the satisful to the piece of the satisful to the satisful to the satisful to the satisful to the satisful to the satisful to the satisful to the satisful to the satisful to the satisful to the satisful to the satisful to the satisful to the satisful to the satisful to the satisful to the satisful to the satisful to the satisful to the satisful to the satisful to the satisful to the satisful to the satisful to the satisful to the satisful to the satisful to the satisful to the satisful to the satisful to the satisful to the satisful to the satisful to the satisful to the satisful to the satisful to the satisful to the satisful to the satisful to the satisful to the satisful to the satisful to the satisful to the satisful to the satisful to the satisful to the satisful to the satisful to the satisful to the satisful to the satisful to the satisful to the satisful to the satisful to the satisful to the satisful to the satisful to the satisful to the satisful to the satisful to the satisful to the satisful to the satisful to the satisful to the satisful to the satisful to the satisful to the satisful to the satisful to the satisful to the satisful to the satisful to the satisful to the satisful to the satisful to the satisful to the satisful to the satisful to the satisful to the satisful to the satisful to the satisful to the satisful to the satisful to the satisful to the satisful to the satisful to the satisful to the satisful to the satisful to the satisful to the satisful to the satisful to the satisful to the satisful to the satisful to the satisful to the satisful to the satisful to the

THE FRAT
In 1851 Erdmann, in a communication made to the In 1851 Erdmann, in a communication made to the Reyal Rockety of Sciences at Leipsic, called attention to a precular attention of the which be the controlled to the control of the second to the second to the second to the second to the second to the second to the second to the second to the second to the second to the second to the second to the second to the second to the second to the second to the second to the second to the second to the second to the second to the second to the second to the second to the second to the second to the second to the second to the second to the second to the second to the second to the second to the second to the second to the second to the second to the second to the second to the second to the second to the second to the second to the second to the second to the second to the second to the second to the second to the second to the second to the second to the second to the second to the second to the second to the second to the second to the second to the second to the second to the second to the second to the second to the second to the second to the second to the second to the second to the second to the second to the second to the second to the second to the second to the second to the second to the second to the second to the second to the second to the second to the second to the second to the second to the second to the second to the second to the second to the second to the second to the second to the second to the second to the second to the second to the second to the second to the second to the second to the second to the second to the second to the second to the second to the second to the second to the second to the second to the second to the second to the second to the second to the second to the second to the second to the second to the second to the second to the second to the second to the second to the second to the second to the second to the second to the second to the second to the second to the second to the second to the second to the second to the seco

by Prof. Cohen. by Frof. Cobies.
The dissess studied by Brdmann and Fritssche is designated by Frof. Cobies as tin pest. The metal thus affected weells in spots, forming ward like blatters, from which small drops issue and hang supended in very much the same smaner that drops of sulfastives will achieve to polished copper coins in the further propries of the disease, the blatters be-

ne larger and the metallic on disappears more and more The interior of the mass is affected last, as can be shown by sawing through the metal whose sawing through the metal whose surface has become quite duli When the entire mass has been transformed, it crumites read-ily, and consists partly of a granular powder similar to anuar powder atmiar to ad, and partly of more or less consistent fibrous lumps of all sizes up to that of a fist. When a piece of tin is cooled artificially, the modification appears first at isolated spots, from which it ed spots, from which it spreads in wart-like bilsters and later forms a columnar struc-

n of cold is distinctly gray,

action of cold is distinctly gray, the upplication of heat produces a remarkable change. Even by merely covering it with hot water, the dark gray color is lighter, approaching that of ordinary tin. The change is due to the temperature acculatively. If a specimen of powdery modified tin is heated in a closed reesel by means of a water bath, it not only assumes a lighter color but decreases in private the remarkable of the color but decreases in private the remarkable or the results of the color but decreases in private the results or the color but decreases in the color but decreases in the color but decreases in the color but decreases in the color but decreases in the color but decreases in the color but decreases in the color but decreases in the color but decreases in the color but decreases in the color but decreases in the color but decreases in the color but decreases in the color but decreases in the color but decreases in the color but decreases in the color but decreases in the color but decreases in the color but decreases in the color but decreases in the color but decreases in the color but decreases in the color but decreases in the color but decreases in the color but decreases in the color but decreases in the color but decreases in the color but decreases in the color but decreases in the color but decreases in the color but decreases in the color but decreases in the color but decreases in the color but decreases in the color but decreases in the color but decreases in the color but decreases in the color but decreases in the color but decreases in the color but decreases in the color but decreases in the color but decreases in the color but decreases in the color but decreases in the color but decreases in the color but decreases in the color but decreases in the color but decreases in the color but decreases in the color but decreases in the color but decreases in the color but decreases in the color but decreases in the color but decreases in the color but decreases in the color but decrease point of mercury, it again b

it was before heating If modified, tin is heated to it was before heating it modified, tin is heated to fusion, an appreciable proportion will remain in the exidised state. The molten portion will upon solidifi-cation assume the appearance of ordinary tin, and to cooled to a low temperature, it can be transformed



Brass kettle correded by the wrought metal

again into the gray modification. Ordinary tin has a specific gravity of 728, but gray tin is considerably lighter, having a gravity of only 575 Prof Cohan directed his attention at first to determining the temperature at which ordinary tin is

the fast, stated above, that the two terms of the have different specific pravity. The apparatus employed is very similar to an ordinary thermometer, except that the capillary tube fapon at the top. The tower part of the bulb is filled with gray tin, the upper part of the bulb is filled with gray tin, the upper part of the bulb is filled with gray tin, the upper part ratus a portion of the capillary tube with a liquid insert relatively to tim, such as pertoion. The appratus facts to a temperature (aary 18 deg C) as for degrees above the probable critical point, so that a portion of the gray this is transformed into the watte variety. Then the apparatus is hope, for the periodic probability of the periodic continuation of the periodic continuation of the scale hope of the periodic continuation of the scale After a few minutes.

noculation with wrought notal disease. Antique coffee pet perforated by the fin Results of incents

transformed into the gray modification, the results transformed into the gray monograph, the resultance of the obtained by former investigators differing validity, some having found 36 deg (Contigrade) as the critical point, others 100 deg, etc. Fritza-hofs apperiments indicating that the transformation was enablicating for reversible, it was to be expected that there would be a definite temperature at which the trans-

ical point must be above 15 dec.
C. By successive operations a gradual approach to the critical print is obtained by working at tomperature alter-nately above and below said point, and when the limits have been restricted sufficiently, interpolation is resorted to This method also showed that the critical temperature must be in the neighborhood of 20 deg C. temperature must be in the neighborhood of 20 deg C, and careful determination proved it to be almost ex actly 18 deg Centigrade (about 65 dog Fabrenbeit) Since all tin utensits employed by us are made of the white modification, it follows that they are gen-

the scale After a few minutes it will be found to have fallen a w millimeters thus indicatis

that 21 dog C is still above the critical temperature, for as long as the formation of white tin continues, the mass of tin con-tracts in volume, owing to the

greater specific gravity of white greater specific gravity of white tin The temperature being then kept constant for a time may at 15 deg C, observation will show a rise of the petroleum column,

thus indicating that the volume of the tin has increased by the

formation of the specifically lighter gray tin, so that the crit

formation might proceed in either direction. Frot Coben employed two independent methods for determining this critical temperature. One, an electrical mathod, consisted in bringing two separate bodies of gray the into a vessel containing a 10 per cent solution of chlorostannate of ammonium. The two bodies of the are connected with an apparatus permitting the experimenter to observe and measure any electromotive force arising in the cell. As iong as both bodies are of the same temperature, there is no electromotive force, But if one of the timb bodies.

is given the temperature of boiling water, and the other that of cold water, the heated body is transformed into ordinary white tin, while the cooled body romains gray The electromotive force manifested formed into focusar, and formed into force unsuffested under these conditions was measured at different temperatures. At about 20 deg C the electromotive force was equal to sero, indicating that the critical lein perature is in the neighborhood of 20 deg C. Prof. and that the reason of the chiprostanperature is in the heignormous of a vege of the chlorostan-nate of ammonium solution accelerated the transfer-mation considerably, in both directions The other method was a volumetric one based on he fact, stated above, that the two forms of tin have



the best of flower the three wests and indeed





Motal injected by tin port. CONTACTOR DISEASES OF METALS. .



Infected sheet tin from Retenburg (ity Hall.

erally in an anetable compared and liable to be trans-formed parily into the gro variety, except on days when the temperature exceeds 65 deg Pahrenheit. The second method described above was also util-ized to ascertain at what temperature the transforma-

tion becomes

lises to assortian at what temperature the transformation of white tin into gray tin proceeds with the
greatest rapidity and this was found to be the case at about 48 deg. Centigrade below zero (about 54 deg F

An interesting discovery was that the transforms An interesting discovery was that the transforma-tion is heatened considerably by the presence of a few particles or "germs" of gray tin it follows that if an "infected" piece or object of white tin is left to itself at temperatures below 85 deg. Fabrunheit, the transformation will proceed constantly and with in-creasing rapidity, for each particle of gray tin, as soon as it is formed, becomes a new germ accelerat-ing the transformation Prof Cohen has given this phenomenon the name of tin pest in view of the germ like or infectious action of the gray tin particles, and also in view of the fact that the tin so attacked is practically ruled, since the restoration of the by meiting is attended with great losses owing to the sirong oxidation which takes place during the heating on account of the finely divided condition of the

The formation of histors during the conversion of the tin into the gray variety is a natural consequence of the increase of volume, since gray tin is about 35 per cont lighter than white tin

The articles which have been exposed to low temperature for a long time, say several construction, proceeding the activation of the articles are supported to exhibit a maximum of deterioration. This is indeed the case, as has been proved by the condition of antique tin vases, medain, and other objects due up in our time? In maximum, too, the deterioration of tin articles has been observed frequently, but the cause wean tou understood and no remedy was known. In the light of Pref Cobern's discoveries, the remedy is simple we have only to see to it that the articles are never exposed to choose discoveries, the remedy is simple we have not to see to it that the articles are never exposed to have the control of the articles are never exposed to have the control of the articles are never exposed to for the company of the control of the articles are able been reported, the articles had been exposed to low temperatures during the writter. Tin articles which have been exposed to low tem-

The WHILE WARNING MATCH INMANS
STRAINP phenomena were observed by R. von Hauslinger at the titmes selfer seems of an air-compresser
insher of times the selfer seems of an air-compresser
make of times sheet from The solfer had nested
away in apota, as it were, and had assumed a crystalline structure, the tin covering of the sheet iron had
become granular and duil on its entire surface. Its
was unlikely there result was dus to tin pea, then
the compressor had seldom, if ever, been append to
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the time became crystalized in minute warf the
bedies and the duil portion would append gradually,
but the rate of growth decreased with the increasing
distance from the center of infection R. you Hase-WHOUGHT METAL DIRE distance from the center of infection R. von Hass-linger thought that the phenomenon was due to crystailisation, and continued his experiments, showing that the modified tin had a lower melting point than the original metal, about 205 deg Centigrade instead of 232 deg He also found that tin foil infected on one side would become modified on both sides. Other experiments made by him, however, seemed to indirate that the crystallisation theory was erroncous, and he published the result of his observations with an acknowledgment that he was unable to account for them An untimely death having prevented von Hasslinger from concluding his investigations, his teacher, Prof Guido Goldschmiedt, of Praguo, drew Prof Cohen's attention to the unexplained phenomena and suggested that he continue the research Prof Cohen repeated von Hasslinger's exper-

and verified them in many ways. He ascertained that the small lead contents of the tin would in no way be held responsible for the result. He first believed that the phenomena might be explained by the forma-tion of the rhombic modification of tin which is un stable at temperatures below 161 deg C, having a tendency to resume the normal tetragonal form. If this hypothesis had been correct, the phenomena should have been absent at temperatures of 161 deg. C. and above Experiments, however, showed that the transabove Experiments, however, snowed that the transformation into the new dull powdery form of tin took place at 184 deg. C even more rapidly than at lower temperatures. This hypothesis therefore had to be

abandoned Prof Cobes then turned to another explanation, based on two well-known facts. First, that a metal which has been subjected to a tennile or to a conspeciation strain (such motal being designated as "mycoughe mptal" by Prof. Cobes) has an electrispic designation of the professional strain (such motal being designated as "mycoughe mptal" by Prof. Cobes) has an electrispical strain of the professional strain of the p

has not been subjected to mechanical forces; meaned, that several metals, its among others, have the preju-erty of recrystallization, that is, of exphilting a growth of their individual crystal grains, more pa-sicularly at high temperature. It is well known that two spacimess of "wrought metal" are sufform shoulterly fenitived in an understa-tive second of the present of the second of the con-traction of the second of the second of the con-tent of the second of the second of the second tion of "nawrought metal". This tandency, slight at confiner temperatures, outsit theseestably to these confiner temperatures.

condition, having a tendency to return to the constitution of "mavrogati metals" This tendency, slight at ordinary temperatures, ought theoretically to be strengthened by an increase of temperature that the contact of the content o Another experiment consisted in applying to a moiré plate auch as mentioned above, some powdered inferted tin foil and on top of this, a polithed plate ned sheet from Heating to 100 deg. C caus of tinned sheef from Heating to 100 deg. C caused the pollahed plate to be affected immediately, while the moiré plate remained unaîtered even aftar 14 hours. It follows that "a rought tin" (rolled tin, tinned

it follows that "srought tin" (redied Un, tinded Un, tinded beeckinn the full) must be considered an unstable product, in process of recrystallization. The form which is stable as ordinary mangestar, is the gray "I, but the transformation is extremely alow at such temperature within certain limits, an increase of temperature increase the registry of transformation Contact (Incondation) "AID, they may apply the management of the transformation of the contact the contact of the contact of the contact of the contact of the contact of the contact of the contact of the contact of the contact of the contact of the contact of the contact of the contact of the contact of the contact of the contact of the contact of the contact of the contact of the contact of the contact of the contact of the contact of the contact of the contact of the contact of the contact of the contact of the contact of the contact of the contact of the contact of the contact of the contact of the contact of the contact of the contact of the contact of the contact of the contact of the contact of the contact of the contact of the contact of the contact of the contact of the contact of the contact of the contact of the contact of the contact of the contact of the contact of the contact of the contact of the contact of the contact of the contact of the contact of the contact of the contact of the contact of the contact of the contact of the contact of the contact of the contact of the contact of the contact of the contact of the contact of the contact of the contact of the contact of the contact of the contact of the contact of the contact of the contact of the contact of the contact of the contact of the contact of the contact of the contact of the contact of the contact of the contact of the contact of the contact of the contact of the contact of the contact of the contact of the contact of the contact of the contact of the contact of the contact of the contact of the contact of the contact of the contact of the contact of the contact of the conta



particular conditions. Similar effects of con partecular consequence comman executives corresponding were observed on knew door handles, and Pref. Cohen also thinks that "wrought metal disease" accounts for the peculiar designation of the rolled lead roof of a acid factory The temperature of from 40 des C to 60 deg C., to which the roof had been exposus very favorable to the recrystallization process

### The Current Supplement.

The opening article of the current Suprasherr, No. 1798, describes a saw-dust compressing machine.—Recent desalogments of American locomotives are discussed—Mr Leon A Hacketth secolient article on 4 — **j**ar cussed—qur_excen A Harrette excellent article on the Processes in Cotton Bjinning is concluded—Prof. J. A. Swing reviews the work of Lord Kelvin in telegraphy and navigation—in an excellent article entitled 'Oil Field Phonomena," M. A. Boeby Thompentitied 'Oil Fleet Pronomena,' Mr. A. Booby Thomp-son gives a brief review of the mode of occurrence of petrolsum and the means adopted for its search and recovery—Mr. R. T. Hewlett writtee on sourced milk from the Metchnikoff standpoint.—Plant anesthetics is explained by S. Leonard Bastin

It is reported in the Electrician that the Chicago Elevated Rallway Commission is considering Strong plans to solve the problem of through router for elevated trains in that city Thirty-sight plans was submitted to the Commission, and five of these were selected for more carried study. Mr. B. J. Arnold, who is challenged of the commission, feat that who is challenged of the commission of the Commission, feat that the commission of the Commission of the Commission of the Commission of the Commission of the Commission of the Commission of the Commission of the Commission of the Commission of the Commission of the Commission of the Commission of the Commission of the Commission of the Commission of the Commission of the Commission of the Commission of the Commission of the Commission of the Commission of the Commission of the Commission of the Commission of the Commission of the Commission of the Commission of the Commission of the Commission of the Commission of the Commission of the Commission of the Commission of the Commission of the Commission of the Commission of the Commission of the Commission of the Commission of the Commission of the Commission of the Commission of the Commission of the Commission of the Commission of the Commission of the Commission of the Commission of the Commission of the Commission of the Commission of the Commission of the Commission of the Commission of the Commission of the Commission of the Commission of the Commission of the Commission of the Commission of the Commission of the Commission of the Commission of the Commission of the Commission of the Commission of the Commission of the Commission of the Commission of the Commission of the Commission of the Commission of the Commission of the Commission of the Commission of the Commission of the Commission of the Commission of the Commission of the Commission of the Commission of the Commission of the Commission of the Commission of the Commission of the Commission of the Commission of the Commission of the Commission of the Commi it is pointed out that each of the four elevated rail, way companies is operating under a separate opinance granted by the city, and that the inter-neithed of the elevated lines is caused by the city and that the inter-neithed "Union loop. The companies are deviced in "elevations" Union loop. The companies are deviced in whether there can afferd to head possessingly of the state of the second to the second that the companies of the second to the there is super-neity a desiry on the second to replace in pointing of the granteness concerned to replace in pointing of the granteness.

## Control outlines.

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ORG. HIRAR MARR.

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To the Editor of the Sunsarrie American:
Relative to your suggestion, regarding the new word proposed by Mr. Wood, namely, "mechaniquistac," it seems to me rather complicated, and I would suggest that the more homely term, machining or me

gost that the more amounty term, machining or machined, would be far more appropriate in the application which he suggests.

E. W. Moonred.
Whatebury, Conn.
[The term mechanipulate does not rafer to the "machining" but to the mechanical handling, 1 e., moving, placing, centering, etc., of a piece of work,

SIVING THE APPRABANCE OF RELIEF TO PICTURES.

To the Editor of the SCHRETPIC AMBRICAN'
A simple method of giving the appearance of relief A simple method of giving the appearance of relief to pictures can be seen by the experiment that if a sheet of glass with minute cylindrical fluting on a side held against a photograph, with the series of finise vertical, be viewed through, the dispersing light gives the picture a stereographic effi-

solidity.

The utility of a minutaly fluted dispersing picture cover glass screen therefore can be shown, which is caused by the semicircle dispersion by the cylindrical fluiss of the light that is reflected by the photograph.

The determining factors are the minuteness of the fluting and the position and the thinness of the

ing acrem

The dispersion of the light by the refraction through these adjoining fittee of this stereoscopic acrem probable to each eye a different appropriate view of the picture, which produces the impression of solidity and depth.

A. F. WOOD CHEROWETE

London, England

Scientific American Prince for Inventors,

The SCIENTIFIO AMERICAN offers \$100 in three p The Scientific american offers \$100 is three prise, to be awarded to the inventor who gives the best account of how he conserved his invention, how he developed it in actual practice, and how he succeeded

diveloped it in actual practice, and how he succeeded in seiling it. This sum of 150 to be distributed as follows 480 to the best account, 885 to the second best account. There is no limitation as to subject matter of the invantion. In other words, the lovention days invantion. In other words, the lovention may be homeshold utensil, a game, a piece of electrical apparatian, an improvement in railway construction, a making and improvement in railway construction, a best uniquely process, etc. The following conditions, how-

iurgical process, etc. The following conditions, how-ever, must be observed.

1 The invention must be parented.

2. The invention must have actually sold his patent, and the invention must have been commercially in-

3 The account of the inventor's success must not be

troduced.

3 The account of the larventor's summen must not be longer than 860 words.

4 The composition, letter, or article must be type-written on one side of the paper only of the composition of the paper only of the composition of the paper only of the paper only of the paper only of the paper only of the paper only of the paper only of the paper only in written. A second seased circleps must be provided, bearing on the continies the paper of the paper of the paper of the paper of the paper of the paper of the paper of the paper of the paper of the paper of the paper of the paper of the paper of the paper of the paper of the paper of the paper of the paper of the paper of the paper of the paper of the paper of the paper of the paper of the paper of the paper of the paper of the paper of the paper of the paper of the paper of the paper of the paper of the paper of the paper of the paper of the paper of the paper of the paper of the paper of the paper of the paper of the paper of the paper of the paper of the paper of the paper of the paper of the paper of the paper of the paper of the paper of the paper of the paper of the paper of the paper of the paper of the paper of the paper of the paper of the paper of the paper of the paper of the paper of the paper of the paper of the paper of the paper of the paper of the paper of the paper of the paper of the paper of the paper of the paper of the paper of the paper of the paper of the paper of the paper of the paper of the paper of the paper of the paper of the paper of the paper of the paper of the paper of the paper of the paper of the paper of the paper of the paper of the paper of the paper of the paper of the paper of the paper of the paper of the paper of the paper of the paper of the paper of the paper of the paper of the paper of the paper of the paper of the paper of the paper of the paper of the paper of the paper of the paper of the paper of the paper of the paper of the paper of the paper of the paper of the paper of the paper of the paper of the paper

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projected these deaths and sufferings among our prices people, have striven to interest public opinion in the substitution of orderestions of the great inclinal, holder yeary with its particia, while at the sand jims much make and suner, and at least as considered to be a substitution of orderestions of the great inclinal, hold year by your the success of design with all heads of the properties of the pro

gratifying to all but the "bustness interests" involved in The Journal of the American Medical Association has for severy years past demonstrated by statistical separating number and observator of the constantial to reacting region for the control of the constantial to reacting from our wonted oxiderations. As I have stated, these survivales alone furnished risk ciscaus deadle, in those years; and the unitarilated five income for the training in the influence seasining because to medical place in the training in the influence seasining because to medical place of the stated of the stated post, it will be deadlest to otherwise the took resident ones, it will be deadlest to otherwise to the otherwise of these stated ones, it will be deadlest to otherwise the other took in this past increased revenue, in the death of survivale of these resources of the stated of survivale of these resources of the stated of survivale of these control of the stated of the survivale of these control of the stated of the survivale of these control of the stated of the survivalence of the stated of the survivalence of the stated of the survivalence of the stated of the survivalence of the stated of the survivalence of the survivalence of the stated of the survivalence of the stated of the survivalence of the survivalence of the survivalence of the survivalence of the survivalence of the survivalence of the survivalence of the survivalence of the survivalence of the survivalence of the survivalence of the survivalence of the survivalence of the survivalence of the survivalence of the survivalence of the survivalence of the survivalence of the survivalence of the survivalence of the survivalence of the survivalence of the survivalence of the survivalence of the survivalence of the survivalence of the survivalence of the survivalence of the survivalence of the survivalence of the survivalence of the survivalence of the survivalence of the survivalence of the survivalence of the survivalence of the survivalence of the survivalence of the

ill classes of publications are taking up the propands begun by the American Medical Association property of purioutions are taking up the prope-pands begun by the American Medical Americation; sewspapers and magazines are utilizing the statistics which its Journal has submitted One magazine imagines the puritie of a vote by Congress to sacrieach year one unknown boy as a national Fourth of-July offering—the newspaper extras announcing the groteque and extraordinary action, editorial denu-ciations of our law-makers, the public agitation and customs or our newmakers, the public agrission and suppress indignation, petitions to Congress and the President, the furmit that would inevitably stend the execution of such an act of madness. Yet we have supplied been allowing, year after year, with the abso-ints certainty of the result before us, the slaughter of hundreds and the mutilation of thousands of our children, with the natural consequence in suffering, torture of mind, and desolation in many households Our people are indeed well on the way to grasping Our people are indeed well on the way to grapping the logic of these presentments. Everywhere individ-uals, ovice societies, and kindred organisations are at work, measures are on for the formation of a na-tional committee to promote a "aafe and same Fourth". tional committee to promote a "arte and sane Fourin",
municipia nathorities are acting understandingly, to
legislation hitherto enacted, more has been or will be
added the year. The action of the Medical Society
of the Sists of Ponnsylvania is especially noteworthy
by reason of its comprehensive obstantier. Its Com
mittee on Independence Day Fatalities recommends Legal control of the importation, manufacture, and sale of explosives used only for purposes of celebra tion; municipal control of the use of firearms and orks during the Fourth-of July season, m or neworks during has yourned July season, municipal participation in substitution methods, the organisation of societies for both control and substitution purposes, the most complete possible systematic use of tetanus antitoxin, and other medical measures in

of tetams antitotin, and other medical measures in both the course of apple (blood pol soning) control to the control to the control to the control to the control to the control to the control to the control to the control to the control to the control to the control to the control to the control to the control to the control to the control to the control to the control to the control to the control to the control to the control to the control to the control to the control to the control to the control to the control to the control to the control to the control to the control to the control to the control to the control to the control to the control to the control to the control to the control to the control to the control to the control to the control to the control to the control to the control to the control to the control to the control to the control to the control to the control to the control to the control to the control to the control to the control to the control to the control to the control to the control to the control to the control to the control to the control to the control to the control to the control to the control to the control to the control to the control to the control to the control to the control to the control to the control to the control to the control to the control to the control to the control to the control to the control to the control to the control to the control to the control to the control to the control to the control to the control to the control to the control to the control to the control to the control to the control to the control to the control to the control to the control to the control to the control to the control to the control to the control to the control to the control to the control to the control to the control to the control to the control to the control to the control to the control to the control to the control to the control to the control to the control to the control to the control to the control to the control to the control to the control to the c In manife been paragraft from to policy would be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be to be

the taking the height, he statisted as allittled of 7 500 feet in 7 minutes. It took him a half hour to reach the respect height. He descended in critice the same as when he sacended, and when within a hundred feet of the ground, he shit of the motor and date shit of the same and the shift of the same and the shift of the reach and the shift of the reach and the shift of the reach and same and the shift of the shift of the shift of the shift of the shift of the shift of the shift of the shift of the shift of the shift of the shift of the shift of the shift of the shift of the shift of the shift of the shift of the shift of the shift of the shift of the shift of the shift of the shift of the shift of the shift of the shift of the shift of the shift of the shift of the shift of the shift of the shift of the shift of the shift of the shift of the shift of the shift of the shift of the shift of the shift of the shift of the shift of the shift of the shift of the shift of the shift of the shift of the shift of the shift of the shift of the shift of the shift of the shift of the shift of the shift of the shift of the shift of the shift of the shift of the shift of the shift of the shift of the shift of the shift of the shift of the shift of the shift of the shift of the shift of the shift of the shift of the shift of the shift of the shift of the shift of the shift of the shift of the shift of the shift of the shift of the shift of the shift of the shift of the shift of the shift of the shift of the shift of the shift of the shift of the shift of the shift of the shift of the shift of the shift of the shift of the shift of the shift of the shift of the shift of the shift of the shift of the shift of the shift of the shift of the shift of the shift of the shift of the shift of the shift of the shift of the shift of the shift of the shift of the shift of the shift of the shift of the shift of the shift of the shift of the shift of the shift of the shift of the shift of the shift of the shift of the shift of the shift o

course. There was very little firing this day on account of the wind.

The third day of the neet Brookins again attempted to make an altitude record, but only succeeded in reaching a height of a little over 1,700 feet. After the unaberformance of the five Pringith Highners, Owville Wright made a flight in which be performed numerous and daring evolutions over the trees in the surrounding fields. His masshine flew very stendily and made sharp turns, but did into above the additional made and the surrounding fields. His masshine flew very stendily described the Hamilton exhibited in his Ourties hiplane at "bilencies."

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On the fourth day of the meet aviator Brookins well think, centle Orville Wright in the fancy maneuvers of givented and in the sharp turns he made. He creathe appreted and in the sharp turns be n

ed a new world's record for turning by making two turns in 6 3-5 and 6 1-5 seconds respectively. The circle he described was less than 150 feet in diameter, The best previous record of this character is said to have been made by one of the Wrights recently at have been made by one of the Wrights recently at Dayton Brooking again attempted to break the alti-tude record, but only succeeded in reaching 1800 feet after a 46-miles assent. He required only 10 miles acro-planes were frequently fright coptender during the aero-planes were frequently fright coptender during the aero-planes were frequently fright coptender during the aero-planes were frequently fright coppeted during the aero-planes were frequently fright copped when for was and wright machine suddenly scoped when he was a bright of 300 feet. He glidded down in a straight time and landed to a field out to altisance away

and landed in a field quite a distance away
On the fifth day, Brookins again attempted, and this on the BITA day, Brookins again attempted, and this time successfully, to break his altitude record After soaring in wide circles for 40 minutes, he reached a height of 4,693 feet. The machine was but a speck in the sky and on account of the base and the lateness of the sky and on account of the base and the lateness of the bour, it was sometimes momentarily lost to view After apparently howering for several minutes, he began a low descent in wide circles. Froothing circled five miles to the east of the motor speedway and gradually closed in upon it. He add difficulty in seeing the track because of the gathering darkness The motor dropped when he was only last way down and he was obliged to make a long gittle. He finally leaded he was obliged to make a long gittle. He finally leaded in a farmer's area couple of miles from his eating part of the state of the control of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of th has yet been made

Indianapolis aviation meet did not draw the crowds anticipated This was doubtless due to fact that only one make of seropians was used

fact that only one make of seroplans was used. In order to have a good sporting event various types of machines must compete At the meeting in Montreal, from the Sids inst. to July 4th, there will be two Blariot monoplanes, in addition to the fire Wright these and the biplane of J A D McGurdy There are be some other machines entered at the last the base of the machines entered at the last the second proposed to the second proposed to the second proposed to the second proposed to the second proposed to the second proposed to the second proposed to the second proposed to the second proposed to the second proposed to the second proposed to the second proposed to the second proposed to the second proposed to the second proposed to the second proposed to the second proposed to the second proposed to the second proposed to the second proposed to the second proposed to the second proposed to the second proposed to the second proposed to the second proposed to the second proposed to the second proposed to the second proposed to the second proposed to the second proposed to the second proposed to the second proposed to the second proposed to the second proposed to the second proposed to the second proposed to the second proposed to the second proposed to the second proposed to the second proposed to the second proposed to the second proposed to the second proposed to the second proposed to the second proposed to the second proposed to the second proposed to the second proposed to the second proposed to the second proposed to the second proposed to the second proposed to the second proposed to the second proposed to the second proposed to the second proposed to the second proposed to the second proposed to the second proposed to the second proposed to the second proposed to the second proposed to the second proposed to the second proposed to the second proposed to the second proposed to the second proposed to the second proposed to the second proposed to the second proposed to the second proposed to the second proposed t

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Dr Michelson will undertake to de-termine the linguistic interrelationship of the greater groups of the Aigonquian languages. For this pur-pose he will with during the soumer the Blackfeet reservation and the Northern Cheyenne reservation in Moniana, then the Windriver In Wyoming, and Monomosi reservation in Wiscoustin, and the Minnas encervations in Qualete and New Brunawick The resorrations in Quaboc and New Brunswick The older of these new apportations in Mr Paul Radiu, who has prosecuted advanced studies in anthropology at the universities in Berlin and Munch, and during the last four years has been a extent under Boas and Paranda to Columbia University in New York city, from which institution he is soon to receive his declerate. Mr Padin has tangely at the College on the decleration of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of the property of property of property of property of property of property of property of property of property of property of property of property of property of property of property of property of property of property of property of property of property of property of property of property of property of property of property of property of property of property of property of property of property of property of property of property of property of property of property of property of property of property of property of property of property of property of property of property of property of property of property of property of property of property of property of property of property of property of property of property of property of property of property of property of property of property of property of property of property of property of property of property of property of property of property of property of property of property of property of property of property of property of property of property of property of property of property of property of property of property of property of property of property of property of property of property of property of property of property of property of property of property of property of property of property of property of pr City of New York, but has decided to relinquish City of New York, but has decided to relinquish teaching in order to follow thinological studies as a life work, and to him the Bursau has assigned special investigations among the Winnebage Indians of Nobrasia. Mr Raddi is the author of numerous power which have appeared in the Estechnitt fitt 50th-mologic, the Journal of American Poli force, and the Company of the Company of the Company of the Company of the Company of the Company of the Company of the Company of the Company of the Company of the Company of the Company of the Company of the Company of the Company of the Company of the Company of the Company of the Company of the Company of the Company of the Company of the Company of the Company of the Company of the Company of the Company of the Company of the Company of the Company of the Company of the Company of the Company of the Company of the Company of the Company of the Company of the Company of the Company of the Company of the Company of the Company of the Company of the Company of the Company of the Company of the Company of the Company of the Company of the Company of the Company of the Company of the Company of the Company of the Company of the Company of the Company of the Company of the Company of the Company of the Company of the Company of the Company of the Company of the Company of the Company of the Company of the Company of the Company of the Company of the Company of the Company of the Company of the Company of the Company of the Company of the Company of the Company of the Company of the Company of the Company of the Company of the Company of the Company of the Company of the Company of the Company of the Company of the Company of the Company of the Company of the Company of the Company of the Company of the Company of the Company of the Company of the Company of the Company of the Company of the Company of the Company of the Company of the Company of the Company of the Company of the Company of the Company of the Company of the Company of the Company of the Company of the Company of t

# THE GERMAN DREADNOUGHT ANA

THE FIRST OF THE GERMAN FLEET OF DREADNOUGHTS TO BE COMPLETED

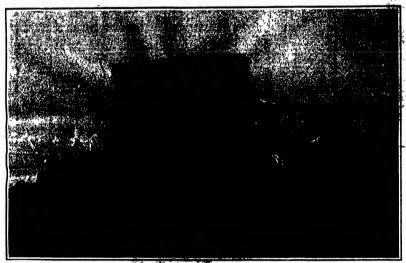
in view of the great secrety which has attended the construction of the 'Namau," the type ship of the feet of German dreadnoughts some surprise was expressed upon the first public view of the ship, that possessed, as a dreadnought, no features of rked novelty. To the people of the United States, here is something fumiliar about the arrangement of her main battery, with its armament of heavy gu carried in six turrets, one forward and one aft of the center line, and four arranged amidships quad rilaterally Their thoughts will be carried back some ritair-nilly. Their thoughts will be carried back some steenly wars to the time when the plans of our distribution with the plans of our distribution of the plans. It is not that the plans of our distribution of the plans of the plans of the plans of the plans of the plans of the plans of the plans of the plans of the plans of the plans of the plans being carried in turns forward and aft and the plans of short goas being mounted four turners two on either beam, arranged at the four crosses of the appearance. This, it will observed in practically the plan followed in the the ships of our own navy, the guns are all mounted upon the longitudinal axis of the ship, and consequently the whole power of the 18-inch bettery can be brought to hear on the broadside throughout a wide are of training.

In justification of their adoption of the quadrilaters' system of mounting, the Germans announce their con-viction that in the engagements of the future there viction that in the engagements or the future that will be more fighting in the end-on or qua tering position than the advocates of the all-centorline system of mounting believe, and they emphasize the fact tem or mounting ceneve, and tooy emphasise the lact that the "Nasaw" can not only concentrate air heavy guns in the end-on position, but that she could de-liver this heavy fire, should the exigencies of an engagement demand it, both forward and astern at the same time. Furthermore, there is a certain advantage in the fact that two gues and four to are held in reserve on the ice side and are greatly protected by the increts which are in engagement on what might be called the weather fighting side of the turret, not only would the prostable &
"New-n" be iner-said Trem \$ to 11 heavy
the end-on fire would-be strengthmed by the
of two more gum, relating it from a counse
state one of sight guns. This is the methin the new Arpustine creaters, the most
dreadmoughts now under construction, whi
asis to fire sight guns abod or sight

twaive on either broadside.

However, in estimating the merits of v sign, we must be careful to bear in misst de-sign, we must be careful to bear in misst the's of displacement, which in the "Nassan" stand very moderate Bigure of 18,500 tons; and, M member that our latest dreadnoughts have re 26,000 tons, it must surely be admitted in Cermans, in view of the limited displacement

The following dimensions, which have be through the courtesy of the German Navy Department be taken as correct. Length, 453 feet, being



Longth, 4d for, Mean, 28 for, Brand, 2015 for, Displacement, Monte, Romal continues, 19 for Space 2 Dai, Minte 1 tors not increase, 21 london, Armanogue 1 Twin 11-in.), Remail continues, 22 london 1 for the Continue of the Continues of the Continues of the Continues of the Continues of the Continues of the Continues of the Continues of the Continues of the Continues of the Continues of the Continues of the Continues of the Continues of the Continues of the Continues of the Continues of the Continues of the Continues of the Continues of the Continues of the Continues of the Continues of the Continues of the Continues of the Continues of the Continues of the Continues of the Continues of the Continues of the Continues of the Continues of the Continues of the Continues of the Continues of the Continues of the Continues of the Continues of the Continues of the Continues of the Continues of the Continues of the Continues of the Continues of the Continues of the Continues of the Continues of the Continues of the Continues of the Continues of the Continues of the Continues of the Continues of the Continues of the Continues of the Continues of the Continues of the Continues of the Continues of the Continues of the Continues of the Continues of the Continues of the Continues of the Continues of the Continues of the Continues of the Continues of the Continues of the Continues of the Continues of the Continues of the Continues of the Continues of the Continues of the Continues of the Continues of the Continues of the Continues of the Continues of the Continues of the Continues of the Continues of the Continues of the Continues of the Continues of the Continues of the Continues of the Continues of the Continues of the Continues of the Continues of the Continues of the Continues of the Continues of the Continues of the Continues of the Continues of the Continues of the Continues of the Continues of the Continues of the Continues of the Continues of the Continues of the Continues of the Continues of the Continues of the Cont "HAMAD" FIRST OF THE GERMAN DREADSOUGHTS.

'Nassau" Incidentally, it may be mentioned that the Japanese have adopted the same arrangement in the first dreadnoughts built for their navy

Obviously, the principal disadvantage of the system is that the ship, although she mounts tweive heavy guns, can bring only eight of them to bear upon either broadside, at least four guns being masked by the superstructure or hy the other turrets while she is fighting a broadaids engagement with the enemy In be possible for the fleet to make a complete turn of 180 degrees, and bring four hig guns, with their gun

rews entirely fresh, into the fight.

To these arguments it will, be answered that, by moving one of the four amidably turrets forward and placing it at a sufficient height to fire above "the t turret, and removing anoth aft and giving it a similar relation to the after

feet, draft, 38½ feet; displacement, 18,500 tees; normal coal supply, 840 tees. The "Nassau" is driven by triple explaces, and on her trials considerably or consider the contrast speed of 18 knots and may be set contrast and the contrast and the contrast and the contrast and the contrast and the contrast and the contrast and the contrast and the contrast and the contrast and the contrast and the contrast and the contrast and the contrast and the contrast and the contrast and the contrast and the contrast and the contrast and the contrast and the contrast and the contrast and the contrast and the contrast and the contrast and the contrast and the contrast and the contrast and the contrast and the contrast and the contrast and the contrast and the contrast and the contrast and the contrast and the contrast and the contrast and the contrast and the contrast and the contrast and the contrast and the contrast and the contrast and the contrast and the contrast and the contrast and the contrast and the contrast and the contrast and the contrast and the contrast and the contrast and the contrast and the contrast and the contrast and the contrast and the contrast and the contrast and the contrast and the contrast and the contrast and the contrast and the contrast and the contrast and the contrast and the contrast and the contrast and the contrast and the contrast and the contrast and the contrast and the contrast and the contrast and the contrast and the contrast and the contrast and the contrast and the contrast and the contrast and the contrast and the contrast and the contrast and the contrast and the contrast and the contrast and the contrast and the contrast and the contrast and the contrast and the contrast and the contrast and the contrast and the contrast and the contrast and the contrast and the contrast and the contrast and the contrast and the contrast and the contrast and the contrast and the contrast and the contrast and the contrast and the contrast and the contrast and the contrast and the contrast and th

### An English Judicial Column of Complex Patents.

as Rugliah Justicals opinion of Compiler Petersta. The competity of prient specification phrasology, and particularly the bewlifering character of the sultime of an American patent, were recently made the subject of a decision of the House of Lords. The case, which five members of the Home were called upon to devide, was that of Linctype and Machinery Limited v. Hopkins We presume that the specification, but the condemnation of the Lords, was attained by the American specification field in England without any chauge. The following is an extract from the decision, the unanimous judgment of the five members of the House of Lords

The appelliant (i. e., the patentrees) has filed a specification which reasonbles a treatise in its length;

it contains no less than sixty olains; there is infinite ordundancy and repetition and constant reference to illustrations which are not very easy to follow. Also pather it is a document which seeds the most positive it is a document which seeds the most principals and posterating study in order than aurona, who wishes no work out problemed of injustration in this class of industry, may know where they stand and bow they may be frust round the danger of injusticals. it contains no less than sixty claims; there is infinite

remore paterns.
"The point whether this patent is good of not close in this case, but I think by in set flow, not actes publishing that those who flat and whore quantitate states explicitly that those who flat and whore quantitate cations must take the risk of having the whole thing cleared well for ampliquity. I have help consign to observe that there is a tendescy to frame qualifications.

and claims so as to pushin a streamt, and it men of bushness late saliths; one as joiness that their injury properties may be high con-they be found guilty of indipagabless. A abuse of the law and will be absorbed if

Urnatum to found contaminate to the contamination of the contamination of the contamination of the contamination of the contamination of the contamination of the contamination of the contamination of the contamination of the contamination of the contamination of the contamination of the contamination of the contamination of the contamination of the contamination of the contamination of the contamination of the contamination of the contamination of the contamination of the contamination of the contamination of the contamination of the contamination of the contamination of the contamination of the contamination of the contamination of the contamination of the contamination of the contamination of the contamination of the contamination of the contamination of the contamination of the contamination of the contamination of the contamination of the contamination of the contamination of the contamination of the contamination of the contamination of the contamination of the contamination of the contamination of the contamination of the contamination of the contamination of the contamination of the contamination of the contamination of the contamination of the contamination of the contamination of the contamination of the contamination of the contamination of the contamination of the contamination of the contamination of the contamination of the contamination of the contamination of the contamination of the contamination of the contamination of the contamination of the contamination of the contamination of the contamination of the contamination of the contamination of the contamination of the contamination of the contamination of the contamination of the contamination of the contamination of the contamination of the contamination of the contamination of the contamination of the contamination of the contamination of the contamination of the contamination of the contamination of the contamination of the contamination of the contamination of the contamination of the contamination of the contamination of the contamination o

# inition's Round-Trip Aeroplane Flight from New York to Philadelphia

A REMARKABLE CROSS-COUNTRY FLIGHT

man sow days after Glenn H. Curties's flight from several sources and several sources are sources and several sources more daring and thrilling flight from New Mark's Philadelphia. This second flight was planned the thrilling flight from New Mark's Philadelphia This second flight was planned to the White Several Several Several Several Several Several Several Several Several Several Several Several Several Several Several Several Several Several Several Several Several Several Several Several Several Several Several Several Several Several Several Several Several Several Several Several Several Several Several Several Several Several Several Several Several Several Several Several Several Several Several Several Several Several Several Several Several Several Several Several Several Several Several Several Several Several Several Several Several Several Several Several Several Several Several Several Several Several Several Several Several Several Several Several Several Several Several Several Several Several Several Several Several Several Several Several Several Several Several Several Several Several Several Several Several Several Several Several Several Several Several Several Several Several Several Several Several Several Several Several Several Several Several Several Several Several Several Several Several Several Several Several Several Several Several Several Several Several Several Several Several Several Several Several Several Several Several Several Several Several Several Several Several Several Several Several Several Several Several Several Several Several Several Several Several Several Several Several Several Several Several Several Several Several Several Several Several Several Several Several Several Several Several Several Several Several Several Several Several Several Several Several Several Several Several Several Several Several Several Several Several Several Several Several Several Several Several Several Several Several Several Several Several Several Several Several Several Seve

Mayor Gaynor of New York to Governor Stuart of Pennsylvania, executed the flight on schedule time During a considerable part of the trip he raced a special train which at times found difficulty in keeping up with him.

The start was made from Governor's Island at 7

A M of Monday, June 13th The actual start took place only after Hamilton had broken a propeller in attempting to start the first time, due to the biase-striking a stick that key upon the ground As acon as he had substituted a new propeller—the very one used (Consinsed on page \$27.)



Regardies, tring above the Property and Railroad tracks in persons of the special train-RAILROAD'S INSTITUTE THE PROPERTY PROPERTY FOR THE TO PRILABELISTIA.

# New Filtered Water Supply for the City of

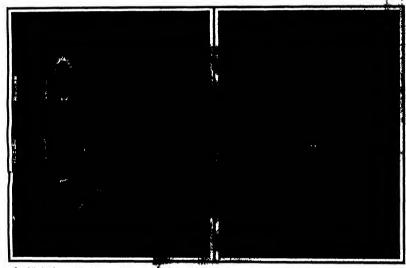
HOW THE ALLECHENY RIVER WATER IS PURIFIED AND DELIVERED INTO THE CITY HAR

There has recently been completed for the city of Greater Pittaburg an ambitious scheme of jure water supply which represents the very latest developments in work of this character. The site for the fittration plant is on the north bank of the Allegheny River about seven miles above the point where it joins the Monongabels to form th Ohio The new plant is lo-cated a short distance at v and on the opposite side of the river to the Brilliant I umping Station which formerly tak water fr m the river direct. The plant extends along the river front for \$700 feet and cov

ers som 225 seres
At the unstream center of the site low lift pumps iocated in what is known as the Ross Point Pumping Station raise the raw water to a cutral receiving or a limentation lasts of 20 000 000 gallons capacity On each side of this rec iving basin is a larger sedimentation lasin and the three have a combined capaci it) of 130 000 000 gailons I com the central : ceiving I tom the central : ceiving gallons per 34 hours when pumping against a total head of 46 feet of which not more than 14 feet is suction lift. The impellers of the pumps are 11 feet 3 inches in diameter. The suction nomites are such 28 inches and the discharge nomic is 35 inches in diam The external construction of these pumps is

needs and de titudence of these pourse desired has been as a second of these pourse desired has been as a second of the pourse of the titudence voir, which has a pagestry of Subblish latter in Sulfi of Judic obsents with a roof, the highe baing careful on the ro inches in diameter, Etyl sing high, sign to counter These arobid up high largest of this type that have ever us provided by two Trinch steel place beauty yield by two Trinch steel place beauty

the Brilliant Pumping Station Originally ing station had a daily capacity of abe-gallons the plant consisting of two 10 c gallons the plant consisting of two 104 billy angines and two 1500000, and free gallon Allis-Chairmer vertical revenues are gallon Allis-Chairmer vertical revenues gallon Allis-Chairmer vertical revenues gallon Allis-Chairmer spennings openings owner a grounds of the filtration plant five filtration plant fights draw grounds of the filtration plant fights draw are have been developed into a very law area have been developed into a very law can be an extended and the state of the filtration plant filtration receiver which control plant filtration receiver with the control plant filtration receiver with the control plant filtration receiver with the control plant filtration receiver with the control plant filtration receiver with the control plant filtration receiver with the control plant filtration receiver with the control plant filtration receiver with the control plant filtration filtration receiver with the control plant filtration filtration receiver with the control plant filtration filtration receiver with the control plant filtration filtration filtration filtration filtration filtration filtration filtration filtration filtration filtration filtration filtration filtration filtration filtration filtration filtration filtration filtration filtration filtration filtration filtration filtration filtration filtration filtration filtration filtration filtration filtration filtration filtration filtration filtration filtration filtration filtration filtration filtration filtration filtration filtration filtration filtration filtration filtration filtration filtration filtration filtration filtration filtration filtration filtration filtration filtration filtration filtration filtration filtration filtration filtration filtration filtration filtration filtration filtration filtration filtration filtration filtration filtration filtration filtration filtration filtration filtration filtration filtration filtration filtration filtration filtration filtration filtration filtration filtration filtration filtratio



One of the four huge or striftern pumps each of which can lift \$5,000 000 gallous per day against a head of 46 foot. The two suction neutles are 28 lashes and the one discharge nomic \$6 inches in diameter. The impeliers are 11 feet 3 inches in diameter. FILTERED WATER SUPPLY FOR THE CITY OF PITTORERS

flowing first to the sedimentation basin and thene to the slow and filters from which it is conveyed to a covered filtered water reservoir the water passes through river. From the reservoir the water passes through river From the reservoir the water passes through the steel cruditis laid under the river to the high savice Brilliant I maing Station which lifts the water to the storage reservoirs that supply the distri-bution system of the city

I he intake has been built back of a revetment which The intake has been built back or a revetment waire, has been constructed along the river bank in front of the Ross station and it consists of a concrete chamber to which the river water is admitted by six teen four foot conduits arranged in two horiso rows of eight each. From the intake the water pa through a 124 inch conduit for a distance of 230

to the pumping station

The Ross Point Station reasures 128 by 200 feet in The Ross Point Statin reseaures 188 by 300 feet in plan. The steam generating requipment consists of right 350-horse power berisontal Sterilag water tube believs arranged in batteries of two each Extending atoms the front of the building is a pump pit 88 feet wide and 18 feet deep in this are placed four Alits Calment berienstal shaft simplestage double-enclose confiringly pamp, shed direct connected to an Alith-Calmest vertical cross-compound confessing Coelius engine Males have placed connection 25 000 800. istration building from which the entire operation of the plant is controlled and directed

infration building from which the entire operation of the pinnt is controlled and directed the pinnt is controlled and directed the pinnt is controlled and directed the pinnt is controlled and pinnt is controlled and pinnt is controlled and pinnt is controlled and pinnt is controlled and pinnt is controlled and pinnt is about three acres. Water is carried to a depth on about fiften feet and the total expectly is 180 000 000 gallons or about one days supply. The \$6 filters have such a suptoe of one seer and a coapering 2 1000 000 gallons per \$8 hours. Each filter bed measure 1819 yields \$7 hours 1800 000 gallons per \$8 hours. Each filter bed measure 1819 yields \$7 hours 1819 yield pinnt is 1800 000 gallons per \$8 hours. Each filter bed measure 1819 yields \$7 hours 1819 yield yields an pinnt is pinnt in the pinnt is pinnt in the pinnt is pinnt in the pinnt is pinnt in the pinnt is pinnt in the pinnt is pinnt in the pinnt is pinnt in the pinnt is pinnt in the pinnt is pinnt in the pinnt is pinnt in the pinnt in the pinnt is pinnt in the pinnt in the pinnt is pinnt in the pinnt is pinnt in the pinnt in the pinnt is pinnt in the pinnt in the pinnt is pinnt in the pinnt in the pinnt is pinnt in the pinnt in the pinnt in the pinnt is pinnt in the pinnt in the pinnt in the pinnt in the pinnt in the pinnt in the pinnt in the pinnt in the pinnt in the pinnt in the pinnt in the pinnt in the pinnt in the pinnt in the pinnt in the pinnt in the pinnt in the pinnt in the pinnt in the pinnt in the pinnt in the pinnt in the pinnt in the pinnt in the pinnt in the pinnt in the pinnt in the pinnt in the pinnt in the pinnt in the pinnt in the pinnt in the pinnt in the pinnt in the pinnt in the pinnt in the pinnt in the pinnt in the pinnt in the pinnt in the pinnt in the pinnt in the pinnt in the pinnt in the pinnt in the pinnt in the pinnt in the pinnt in the pinnt in the pinnt in the pinnt in the pinnt in the pinnt in the pinnt in the pinnt in the pinnt in the pinnt in the pinnt in the pinnt in the pinnt in the pinnt in the pinnt

eral feet of not! which has been pedded. Macadan road drives planeds with trees have been laid out an a natural vocated alone at the belot of the plant he born left nachanged. The delivery of filtered water with the beaut early in 1900. The full equantity of the origin and filters was regarded in 1900, and with the construc-The Wallvary of Bleest was begun early fit 1996. The rail papering of the nat filters we enabled in 186, and with the continuous of the base two filters, the quites sixt or of off Platowry will be applied with pipel, dystaker pro- cort illustration in the particular upon we have a particular in protein and the particular to the above particular in proteins of the particular with contract of the particular the particular that proteins are provided in the particular that proteins are particular to the particular that proteins are particular to the particular that proteins are particular to the particular that proteins are particular to the particular that the particular that the particular that the particular that the particular that the particular that the particular that the particular that the particular that the particular that the particular that the particular that the particular that the particular that the particular that the particular that the particular that the particular that the particular that the particular that the particular that the particular that the particular that the particular that the particular that the particular that the particular that the particular that the particular that the particular that the particular that the particular that the particular that the particular that the particular that the particular that the particular that the particular that the particular that the particular that the particular that the particular that the particular that the particular that the particular that the particular that the particular that the particular that the particular that the particular that the particular that the particular that the particular that the particular that the particular that the particular that the particular that the particular that the particular that the particular that the particular that the particular that the particular that the particular that the particular that the particular that the particular that the particular that the particular that the particular that the

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which contained a watery lighted is now hiled with white opaque perfectly solid substance. Some curious and but little known properties of organic substances are used for this performance. of them is the property of said to remain in the fusion state with such a tenacity (in open recession). Fusion state with such a transity (in open vesselime) presence of unlimed air; and for such a time processor of unlimed air; and for such a time processor of unlimed air and the processor of the processor of the processor of the processor of the processor of the processor of the processor of the processor of the processor of the processor of the processor of the processor of the processor of the processor of the processor of the processor of the processor of the processor of the processor of the processor of the processor of the processor of the processor of the processor of the processor of the processor of the processor of the processor of the processor of the processor of the processor of the processor of the processor of the processor of the processor of the processor of the processor of the processor of the processor of the processor of the processor of the processor of the processor of the processor of the processor of the processor of the processor of the processor of the processor of the processor of the processor of the processor of the processor of the processor of the processor of the processor of the processor of the processor of the processor of the processor of the processor of the processor of the processor of the processor of the processor of the processor of the processor of the processor of the processor of the processor of the processor of the processor of the processor of the processor of the processor of the processor of the processor of the processor of the processor of the processor of the processor of the processor of the processor of the processor of the processor of the processor of the processor of the processor of the processor of the processor of the processor of the processor of the processor of the processor of the processor of the processor of the processor of the processor of the processor of the processor of the processor of the processor of the processor of the processor of the processor of the processor of the processor of the processor of the processor of the processor of th



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### Scientific American

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the gradullustion but vigorous shaking for hote is assented invariably transferent the liquid is not said within mass. At the moment of the soliding the mass are supported in the cold the instantaneously becomes but. The property of solid camphor to rapidly melt into a liquid compound whenever ground or shaken the said alleged compound whenever ground or shaken the time to the two ches to the two charges must be finally produced and the complete is sprinkled with a few drops of alsohol the two the ground. The two white powders look slike and are superposed in the tube two parts in volume of campler being taken for one of chieral hydrate of complete being taken for one of chieral hydrate. The transfer these of confidence is the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the cont

## CRISCLER TURES FROM RELECTRIC LIGHT BULBS.

Many people have wished to perform experiments with Geissler tubes but owing to their high cost have not been able to do so

By the following simple and inexpansive method narone who possesses a one inch or larger induction By the following simple and instructive method anyme who possesses a one-like or larger induces one of one of the format induced one of the format induced one of the format induced one of the format induced one in the format induced one in the format induced one in the format induced one of the format induced one of the format induced one of the format induced one of the format induced one of the format induced one of the format induced one of the format induced one of the format induced one of the format induced one of the format induced one of the format induced one of the format induced one of the format induced one of the format induced one of the format induced one of the format induced one of the format induced one of the format induced one of the format induced one of the format induced one of the format induced one of the format induced one of the format induced one of the format induced one of the format induced one of the format induced one of the format induced one of the format induced one of the format induced one of the format induced one of the format induced one of the format induced one of the format induced one of the format induced one of the format induced one of the format induced one of the format induced one of the format induced one of the format induced one of the format induced one of the format induced one of the format induced one of the format induced one of the format induced one of the format induced one of the format induced one of the format induced one of the format induced one of the format induced one of the format induced one of the format induced one of the format induced one of the format induced one of the format induced one of the format induced one of the format induced one of the format induced one of the format induced one of the format induced one of the format induced one of the format induced one of the format induced one of the format induced one of the format induced one of the format induced one of the format induced one of the format induced one of the format i



Allowing just the right amount of air to kak in is rather difficult process but it can be done most uply as follows

a rather difficult process but it can be done most simply a following a value one is in Fig. 11 make a bill shaped piece as in Fig. 111 with a starp the bill shaped piece as in Fig. 111 with a starp the bill shaped piece as in Fig. 111 with a starp the starp of the piece will come free purpose of this nick is to help the spark puncture the glass. It should not be made deep enough to allow any six to sester the buth. Next attack the wax bell on the bulb so that the end of the wire rats in the bulb so that the care of the wire rats in the current. The spark will samp threspit the sizes and whatever are in in the bell will lake it not the bill. By varying the sizes of the bell different colored glows may be obtained. The wax bell in Fig. 111 shows about the size for the best results with it-eandle power lawny for the size of the bell with which is the size of the bell with which was a believe will show be swittle so that the case of the bell will be size within a color every bulk as a subject of the size of the bell will be size within color effects each different from the other and the results are well worth the trouble worth the trouble

### CONSTRUCTION OF A SUMPLE REDOTROLYTIC INTERRUPTER. ST 6600MS 7 WORT

The electrolytic current interrupter described here key be used in place of the treublecome vibrator on part state. It is to be operated on 50 to 220 volts

direct or alternating curr

direct or alterating current. The luterruptons cover high, being in the neighborhood of 1000 per second. The alterative and every high, being in the neighborhood of 1000 per second. The alterative and electrodes are contained in a wet battery jar. A wood plug should be turned to fit tightly in the upon the per and boiled thoroughly fit tightly in the upon the per country and tight tight in the per country and the per country and the per country and the per country and the tight is per country and the external diameter of the tube bored through the center of the wood cover. The tube is hid in positions than the external camboter or the tube bored through the center of the wood cover The tube is hid in posi-tion by a heavy brams spring pressing against it. For the anode a 1/4 inch round brams rod should be straight-



A SIMPLE PLROPROLITIC THEPPOPPERS

A REFILE EXAMPLE TRADEPTER

and so as to alled very resulty through the stam tube
One and of the rod should be squared off and the other
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#### DEVICE FOR TESTING ELECTRIC WIRISE ----

In testing electric wiring for open circuits grounds or short circuits it is often necessary to skin the in sulation from the wires under test in a number of places so as to connect them to a magneto or other testing device. The accompanying illustration shows



TESTING MEEDLE FOR INSULATED WIRE

a device which does away with this measure for it a device which does away with his necessity for it contains a sharp needle point which can be sally pushed through the insulation until it mak s a good electrical contact with the wire within. The d vice is made out of a hard wood handle borred through aut its whole length to the diameter of Sexible lamp cerd its whose length to the diameter of flexible lamp (crid
The small send is then counterbored to a larger diam
clor and a plug is made that will drive tightly into
the counterbore. The next step is to procure a large
sized sewing needle which is driven through the plug as shown in the sketch. The eye end of the nec is soldered to a length of lamp cord which is pas

through the handle as shown. The plug is then driven into place and the testing handle is ready for use

## CLARISCOPE ATTACHMENT FOR MICHOSCOPES.

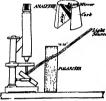
FULBRISHOPE ATTACKERS: FUR RICHMONDERS.

Illustrated herewith is a bit of apparatus by means of which polarised light may be used with any micro scope without changing the instrument itself. The polarizer consists of one down 4 x 5 inch glass negatives which have been thoroughly cleaned and dusted. and are contained in the original box, which has its top and bottom cut out, leaving just enough card around the edges to hold the plates in position

The analyzer comprises a piece of blackened cork with a wedge-shaped slot cut in one side and a bit with a wedge-shaped side (at in one side and a bit of black mirror formly pressed into position in the side at the polarising angle. This rests on the expect of the utraceops and may be turned at any angle in the horizontal plane. The black mirror is made of plate plass or cover gians, coated on the key with a mixture of impulsark and absiles varnish or. If soore convenient, impusack and give. The draw large shows the arrangement of the apparatus with the Nicola' crossed A small scale may be attached to the top of the analyzer, so that the angle through which is in turned may be noted

which it is turned may be noted.

This scheme may also be applied to a simple, or dissecting, microscope. For simplicity and cheapness, combined with a high degree of officiency, I do not



WIGHOUGH ARRANGED AS POLARISONFE.

think this apparatus can be excelled to be derived from its use is infinite

## AN ELECTROPLATING OUTFIT

Those who wish to undertake the electro-deposition of measure upon a small scale whether as a business or for pleasure will find that the apparatus and uten-alls luce described will meet the ordinary require-

The photograph reproduced herewith shows the wooden depositing tank and battery of an outfit in actual use. The battery cells are hinde exactly an explained on page 445 of the Bukytiste Americay of

The depositing tank is made in the same way, with The depositing tank is made in the same way, with the exception that the joints are just together with a very thick india rubber cement of the kind used for repairing tires. The woodwork at the joints is first coated with the cement, both at the grooves and the orde, and is allowed to stand for an hour or two, when it is realted again and just together either with when it is caucie again and put together either with until driven in disgonally or with screws. The ex-cess of ribber must be wiped off. In the course of about twenty four hours the inside of the tank must be coated with a burning bot solution of paradin. Un less the paraffin is very hot, it will not penetrate the pores of the wood sufficiently to make it impervious porce of the wood sufficiently to make it impervious to any of the shemical solutions that the tank may contain. The wood used in making a depositing tank must be well seasoned. If possible use old boards one inch thick so that when planed the board is not less than seven-eighths of an inch thick, and at all times then seven-ugans of an ince, not at all times place clears across the bottom, so that it will stand clear of the floor or work bench. The rubber comment used for the joints will not be affected by any of the depositing solutions. The tank illustrated measinsect for the joints with not be affected by such the depositing solutions. The tank illustrated measures 5½ inches long, and 11 inches feep. Five such tanks as these should be made, to contain the following cold working solutions, for all or, nickel, brass copper and sinc. Gold and alkaline coppering solutions must be worked hot, as will presentiv he described

ently be described

Silver Plating - Dissolve 235 ounces silver in a glass flask by adding 3 ounces nitric acid and 1 ounce distilled water Heat the flask slightly and place it where the red nitrous fumes will pass off into a flue where the red nitrous furnes will pass off into a flue, or out of doors. When the silver has become dis-solved, add a quart of distilled water, sir the mix-ture well, thee add gradually about 5 fluid ounces pure hydrochloric acid, silrring the mixture well with a glass rod. Place the flask in a dark place while the white precipitate (chloride of silver) is settling.

Four off the clear liquid, add another quart of water; stir well, allow it to settle, decent; and wesh a third time. This will free the precipitate of impartites formed. Dissolve ½ pound equalde of potassium in & gallon of distilled water When completely dis-solved, add a small quantity at a time to the chlo-ride of silver. But the well, and continue to di-tride of silver. But the well, and continue to di-tride of silver has only just been dissolved. Allow a little time to only just been dissolved. Allow a little time to elapse between each addition. When all the chloride of allow is dissolved make up the quantity to 3% gallom with distilled water. This will be the right quantity to fill the wooden tank, with one ounce of allver to the gallon. Let this solution stand for twenty four hours, so that all dirt will settle, and then m into the tank. The solution

is now ready for use Two shorts of fine altere about 5 inches square must be used for the nancies, suspended by either copper or silver wire kooks upon the copper of copper or silver wire kooks upon the copper rod (abown in the illustration) attached to the wire from the carbon of the battery, while from the best copper rod the articles to be plated must be asspended, this rod be ing attached to the sitne of the battery. The articles a strong solution of common washing sods for trent as a trong solution of common washing sods for trent individually with a stiff stall brush dipped in punites remaining in water, and accurring them they will be solved to the silicative of German surfer, brush, or copper, after soouring and bring attached to the silicative vire, must be dipped into a solved to the silicative vire, must be dipped into a souring term. Two sheets of fine silver about 5 inches square must breas, or copper, after according and being stached to the slinging wire, must be flowed into a soliton of one onnee of nitrate of mercury in a gallon of water. This will give a chemically clean surface and cause the silver to adhere firmly when the deposit size place the silver to subsect flowers that place the silver better the place that the place the silver better to subsect flowers or forth should be subsected in the positive flowers of the soliton of the silver better to subsect flowers that the soliton of the silver better to subsect flowers that the soliton of the silver better the soliton of the silver better the soliton of the silver better the soliton of the silver better the soliton of the silver better the silver better the silver better the silver better the silver better the silver better the silver better the silver better the silver better the silver better the silver better the silver better better better the silver better 


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Gold Plating—Electro-gilding in a small way is

done by making the gold solution as follows ive in 1 quart of hot distilled water 1 curies of cyanide of potassium. Take a small porous fill it about two-thirds full. Place it in the in mil it about two-thirds pull "place it in the inner ves-sal of an outment hettle, and pour in this vessel the balance of synatic solution. Pour a quart of hot water into the cuter vessel, and bring it to the hol-ing point. Take a strip of sheet copper, fix a place of separate view in the same description of separate view in the secondary of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the content of the

gold. Remove the screen por thive saws fis ele-terate, see the emantains liquid for the spoil dispensi-ing, and the piece of sheet gold can be used lip; this anota. Any article after being will channel—sine he coated with gold in this bath, giving a very rich violent Ricks beer in the best liquid to new with a chips, brush in brightnesing the deposit previous to beside gold than for sitter. The articles after risating should be dried in hot boxwood sawdant. Since Passing—Articles can readily be coated with Ricks Passing—Articles can readily be coated with the property of the collection of the coated with the property of the collection of the coated with sites, 10° among a continue of the coated with the property of the collection of the coated with sites, 10° among a continue of the coated with sites, 10° among a continue of the coated with sites, 10° among a continue of the coated with sites, 10° among a coated with the coated with sites, 10° among a continue of the coated with sites, 10° among a continue of possessing and coated with the coated as sirry of sheet cop-per the width of the porcus pot in each, and connect the copper with the battery as for gold, using two large clean rine plates in the ammonia grantes col-rent on until about 5 connect of the have been tiscolved. Remove the porcus cells and throw the contepts away.



COMPLETE OUTFIT FOR ELECTROPLATING.

Add 5 ounces carbonate of potash, silr until dissolved, et the liquid stand until the dirty matter has subsidied, at the liquid stand until the dirty matter has subsidied, and these sjohn gift the dear liquid, which is should be related to the standard of the standard the subsidied by this solution. The articles should be related to the standard to the subsidied by this solution. The articles should be related to the subsidied by this solution. The articles should be related to the subsidied by the subsidied by the subsidied by the subsidied by the subsidied by the subsidied by the subsidied by the subsidied by the subsidied by the subsidied by the subsidied by the subsidied by the subsidied by the subsidied by the subsidied by the subsidied by the subsidied by the subsidied by the subsidied by the subsidied by the subsidied by the subsidied by the subsidied by the subsidied by the subsidied by the subsidied by the subsidied by the subsidied by the subsidied by the subsidied by the subsidied by the subsidied by the subsidied by the subsidied by the subsidied by the subsidied by the subsidied by the subsidied by the subsidied by the subsidied by the subsidied by the subsidied by the subsidied by the subsidied by the subsidied by the subsidied by the subsidied by the subsidied by the subsidied by the subsidied by the subsidied by the subsidied by the subsidied by the subsidied by the subsidied by the subsidied by the subsidied by the subsidied by the subsidied by the subsidied by the subsidied by the subsidied by the subsidied by the subsidied by the subsidied by the subsidied by the subsidied by the subsidied by the subsidied by the subsidied by the subsidied by the subsidied by the subsidied by the subsidied by the subsidied by the subsidied by the subsidied by the subsidied by the subsidied by the subsidied by the subsidied by the subsidied by the subsidied by the subsidied by the subsidied by the subsidied by the subsidied by the subsidied by the subsidied by the subsidied by the subsidied by the subsidied by ate of potash, stir until dis

I quart water, 5 ounces sulphate of sine dissolved in \$\frac{1}{2}\$ gallon hot water Let all the solutions be cold be-fore mixing. Add to the acetate of copper solution \$\frac{1}{2}\$ bint strong water ammonia, 0.880 Just before final mixing, stir this well and add to it the sine solufinal mixing, stir this well and add to it the sine soits ton, together with another y just strong ammonia. Stir this mixture well, then add the potash solution. Stir this mixture well, then add the potash solution and jastry the cynnide solution. Allow this to stand size making the quantity up to four gailons. At the add of about 15 hours poor the clear liquid into the depositing tank, for use. Clean the articles as for eliver pinting, use the battery coupled in multiple, and a large brass anods, arranged so as to regulate and a large brass anods, arranged so as to regulate the quantity of surfaces the liquid. The exact color the quantity of surface in the liquid. The exact color can be obtained by relating and lowering the amode. After a quarter of an hour the articles must be removed, rissed, seretal-bruthed, and returned to the bath for the final deposite. In every eigh in the edge-to-depositing of mustals, suppositely in this gold and breaming, the solor onto the variest by moving the article to and fro in the solvedon during deposition. Silver is also affected by this messan, this deposit boths, we have a supposed on the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the contro

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## Legal Notices

## **PATENTS**

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MANGAGESE STREE HATES

(Concluded from page 518)
rails used by the Boston Elevated rand usou by the Boston Elevated upon the curren were formed by casting. This is, of course, an expensive process in fact, this corporation rati costs about \$5 per foot for the rails. The ordi nary rail costs only about 38 cents per foot, or only 1/3 as much. But even then it is remarded as a good investment, because of the very long life. In the an tunin of 1908 the company had in service tunin of 1808 the company had in service 475 feet of this rail in addition to three crossing frogs and a number of ordinary frogs. Its experience is certainly worthy of attention However, if manganese steel can be rolled to advantage, we may steel can be rolled to advantage, we may seel see a still better material at a lower figure. In fact, such ralls have been rolled to sell for about \$200 per tou, or about \$2.50 per foot (about 85 pound see set) 144 (ton).

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Some of the difficulties of rolling the metal have been given by Mr W 8 Pot for When the temperature has fallen as towards and the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of t However, manganese steel has been suc-cessfully rolled in France, in England, and in the United States.

# EABILTON'S ARROPLANT FLIGHT (Continued from page 521) by Curties in his trip down the Huds

by Curties in his trip down the Hudson — he quickly rose into the air and made a large circle over the island. When he left the shore and started to cross the Lower Bay four or five minutes had clapsed, so that the actual start was made at about 7.40 After flying arross the bay and the Will work the large the world at about 7.40 After flying arross the bay and the Will were Not it sensities. the bay and the Kill von Knii, Hamilton struck the line of the Pennsylvania Rali road at South Elizabeth, and foli road at South Missabeth, and followed it practically all the way to Philadelphia The special train, bearing a white streamer on the roof of the foremost car, soon located him and caught up with (Continued on page 552.)

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The greater part of the trip Hamilton flew at a comparatively slight elevation—about 200 feet. Even in passing over the city of Treuton he rose to only double this height, as he preferred to take the chance of his motor stopping and of his being obliged to descend rather than to cut down his average speed by rising

to a great elevation

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After reaching the field at North Phila delphia and circling about a couple of times Hamilton alighted gracefully at 9 26 A. M., Just 1 hour and 50 minutes from the time he started if a deduction is made for the circling about at the start of fine and finish, the actual time of the slight was about 1 hour and 46 minutes. The article circlings in 44 mins from Government of the circling and the circling and the circling and the circling and the circling and the circling and the circling and the circling and the circling and the circling and the circling and the circling and the circling and the circling and the circling and the circling and the circling and the circling and the circling and the circling and the circling and the circling and the circling and the circling and the circling and the circling and the circling and the circling and the circling and the circling and the circling and the circling and the circling and the circling and the circling and the circling and the circling and the circling and the circling and the circling and the circling and the circling and the circling and the circling and the circling and the circling and the circling and the circling and the circling and the circling and the circling and the circling and the circling and the circling and the circling and the circling and the circling and the circling and the circling and the circling and the circling and the circling and the circling and the circling and the circling and the circling and the circling and the circling and the circling and the circling and the circling and the circling and the circling and the circling and the circling and the circling and the circling and the circling and the circling and the circling and the circling and the circling and the circling and the circling and the circling and the circling and the circling and the circling and the circling and the circling and the circling and the circling and the circling and the circling and the circling and the circling and the circling and the circling and the circling and the circling and the circling and the circling and the circling and the circling and the circling and the 9 26 A M. just 1 bour and 50 minutes

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may semogramen. Light being greated by Governe, and delivering to him the me shown in one of our illusir mitton refilled his fuel and oil nearyen on minutes in starting, and de-apite the fact that the train was driven at the fastest possible speed-80 miles an hour or more—its occupants did not eatch sight of Hamilton until 33 minutes each sight of Hamilton until 32 minutes after they started, while it was about 10 minutes later before they finally over-hauled blm, 2 miles beyond Princeton Junction and 39 miles from the start. Thirty-seren miles had been covered by the special in 34 minutes, including a stop of 2 minutes at Bristol caused by an express trails being in the way. The an express train being in the way. The train and servoplase traveled abresst of each other for a white, and finally Han-tillon dropped slightly behind. He had-covered the first 38 miles of this return formay at the rate of 113 miles as hour, thus making the fastest cross-country light yet accomplated at the small vil-lage of Phinasbore, 41 miles from North Mildelphia, Hamilton again few overraissospais, limition again new over the tracks a thousand feet or more back of the train. The heavy clouds of smooths from the locomotive caused him to seek a higher elevation, and he rose to a height of about 500 feet. Soon after crossing the Raritan River the occupants crossing the Haritan Edwer the occupants of the train were surprised to see Ham itton turn off to the right and pass out of view. It seems he mistook the river for the Kill von Kull, and started, of of view It seems he mistock the river for the Kill von Kuil, and started, of course, toward what he unpposed to be downwards intend. The engine had been missing five on several cylinders, and it is a missing five on several cylinders, and it is a missing five on several cylinders, and it is a missing five on several cylinders, and the decided to alistic, but was quite distingted to find himself in a marsh, from which the meahine was dragard out with no little difficulty. In attempting to several control of the course, in color location beach as proposition of the color of the color of the color of the color of the color of the color of the color of the color of the color of the color of the color of the color of the color of the color of the color of the color of the color of the color of the color of the color of the color of the color of the color of the color of the color of the color of the color of the color of the color of the color of the color of the color of the color of the color of the color of the color of the color of the color of the color of the color of the color of the color of the color of the color of the color of the color of the color of the color of the color of the color of the color of the color of the color of the color of the color of the color of the color of the color of the color of the color of the color of the color of the color of the color of the color of the color of the color of the color of the color of the color of the color of the color of the color of the color of the color of the color of the color of the color of the color of the color of the color of the color of the color of the color of the color of the color of the color of the color of the color of the color of the color of the color of the color of the color of the color of the color of the color of the color of the color of the color of the color of the color of the color of the color of the color of the color of the color of the color of the color of the color of the color of the color of the color of the color o the city the engine again started ing and running on but six cylin Fortunately, however, his height was saint on that he summered in Fortunately, however, his height was nut-ficient, so that he just aucosedd in mak-ing Governor's Island during the course of his iong descent. The 19% miles air-line distance from South Amboy to the Island was covered in about 28 min-utes, and he finally slighted in front of the about 45 Mp. Mr.

the shed at 6 40 P. M.
In addition to this being probably the
fastest cross-country flight ever executed,
Hamilton's performance was a spectacu
lar one, since the flight was made over
water, cities, and open country. When
news was received at New Tork that be
had started on the aviews pin; flowered. water, cities, news was received at New Yors, had started on the return trip, thousan of neople gathered at the Battery, expe of people gathered at the Battery, in the sea him arrive at Govern and at about 1 15 P M. When came that he had been forged to the growd was greatly disapp Netwitheicas, there was a large aliabted b





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the inschine, and the aviator of the coinion that some miss expression this opinion that some miss-platon rings in one ge type of the indexe allowed oil to escape by the ion and foul the spark plugs. There is interruption in the sparking cur-t supplied by the high-tension Booch mote. At any rate, Hamilton's flights was the nonstitute of magnete. At any rate, Hamilton's nignts showed the possibility of carrying mail and important dispatches, and it is intor-esting to note that Representative Shop-herd of Texas has introduced a bill into Congress calling for the investigation of at Office Department into the sere plane for the purpose of carrying mail
Also a few days after Hamilton's
flight, the French war authorities com manded M Biériot to carry a message from the camp of Chaions to Paris, which he did promptly in his monoplane with out any mishap During the present week Hamilton is to experiment for the government at Nashville, Tenn upon the dropping of explosi es from his machine There arner townia will be carried on dur ing the maneuvers

The flights of Custles and Hamilton have spurred many budding aviator attempt in the near future some of the cross country flights for prizes, and new prizes are being offered almost daily for We wish to remind such svi ators that they stand a chause of ning the Scientiste Augustan Trouby If they send in their cutty to us or to the Aero Club of America twenty four bours in advance. The aviator making the est cross-country fight this year will win the trophy for 1910

S) WALTER ( COLD

There are three qualities of emery used in this country-Naxos or Greek, Turk ish, and American

The Naxos brand is imported from th island of Naxos (Greeian Archipelage) Greecs, the mines being controlled by the Greeian government Naxos smery con tains a large percentage of alumina (about 65 per cent) This emery has a (about 65 per cont) This emery has a most excellent fracture, the grains beins, very hard and very pharp, and therefore specially adopted for use in gridding wheels. These characteristics prevent its use, to any solute, for polishing pur-poses, as it rather 'breaks down' nor granulates under pressure of the work, as do the other quantities (Tertals and Americas). An ideal enery for plaths ing must present new cutting points con stantly The Naxos grains are so hard and sharp that it does not properly gran ulate, therefore it is not a desirable pol-ishing medium, except for certain special classes of work. Naxos emery, owing to

tis large percentage of alumina, follows corundum in the scale of hardness Good Turkish smerry contains any where from 10 per cent to 15 per cent to 15 per cent to 15 per cent to 15 per cent to 15 per cent to 15 per cent to 15 per cent to 15 per cent to 15 per cent to 15 per cent to 15 per cent to 15 per cent to 15 per cent to 15 per cent to 15 per cent to 15 per cent to 15 per cent to 15 per cent to 15 per cent to 15 per cent to 15 per cent to 15 per cent to 15 per cent to 15 per cent to 15 per cent to 15 per cent to 15 per cent to 15 per cent to 15 per cent to 15 per cent to 15 per cent to 15 per cent to 15 per cent to 15 per cent to 15 per cent to 15 per cent to 15 per cent to 15 per cent to 15 per cent to 15 per cent to 15 per cent to 15 per cent to 15 per cent to 15 per cent to 15 per cent to 15 per cent to 15 per cent to 15 per cent to 15 per cent to 15 per cent to 15 per cent to 15 per cent to 15 per cent to 15 per cent to 15 per cent to 15 per cent to 15 per cent to 15 per cent to 15 per cent to 15 per cent to 15 per cent to 15 per cent to 15 per cent to 15 per cent to 15 per cent to 15 per cent to 15 per cent to 15 per cent to 15 per cent to 15 per cent to 15 per cent to 15 per cent to 15 per cent to 15 per cent to 15 per cent to 15 per cent to 15 per cent to 15 per cent to 15 per cent to 15 per cent to 15 per cent to 15 per cent to 15 per cent to 15 per cent to 15 per cent to 15 per cent to 15 per cent to 15 per cent to 15 per cent to 15 per cent to 15 per cent to 15 per cent to 15 per cent to 15 per cent to 15 per cent to 15 per cent to 15 per cent to 15 per cent to 15 per cent to 15 per cent to 15 per cent to 15 per cent to 15 per cent to 15 per cent to 15 per cent to 15 per cent to 15 per cent to 15 per cent to 15 per cent to 15 per cent to 15 per cent to 15 per cent to 15 per cent to 15 per cent to 15 per cent to 15 per cent to 15 per cent to 15 per cent to 15 per cent to 15 per cent to 15 per cent to 15 per cent to 15 per cent to 15 per cent to 15 per cent to 15 per cent to 15 per cent to 15 per

activet emery produced, yet is succe fully and largely used for certain class of "soft work."

Most of the Naxos and Turkish emery brought to this country comes in pieces ranging from the size of a marble up to \$5 or 20 pounds in weight. Formerly it was brought over as ballast in ships, but ft became such an important comm mercially, that during the last quar commercially, that during the last quar-illy contray; the speen transported across the water as regular cargo. Turkish qu-cer is brought to the asports of Asia Makor in the same primitive fashoot which has exhibed for many years—on May have defaught. These are an up-to-lishs mining meshods. The one is taken



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from the surface only, and no attempt is mads to follow the emery "leads" when they dip below the surface. Thus their casy and below the surface. Thus their mining methods are thoroughly charac-teriatic of the inhabitants of the entire Turkish empire—crude and antiquated Emery imported from Asia Miner is branded according to the seaport from which it is shipped, the scaports being Smyrna, Kulluk and Syra, the raitway points are Knyujack, Alden, and Azizick The different brands of course vary ac carding to the parity of the emery—the larges the amount of oxide of alumina, the letter the quality

The American emery is mined near Peckskill, New York State. Some very excellent ore has been taken out at that place but the bulk of the emery is high onace but the blink of the omery is high in oxide of tron and therefore soft There is also a smoot deposit in the Star-of kansas, but the deposit is insignifi-cant and the quality of the emery of an inferior character

The following are the physical proper ties of emery. Color black or blue black, specific gravity, 9 1050 ounce. It is thus placed in scale of hardmas. Pure Naxos

special gravity, p. 1656 outer. It is thus priced in solic of fordiness. Pure Naxos St., pure Turkish St., pure American St., title diamond tring No. 10). In its manufacture the emery pusses. through good chilled tolls and croshed. It then purses over screens toade from holiting cloth and from the secons to is parked directly into full keen holding Lathe Book pounds and quarter logs of about 75 Tennick, the number of the energy tennick, the number of the energy tennick of the energy tennick of the energy tennick of the energy tennick of the energy tennick of the energy tennick of the energy tennick of the energy tennick of the energy tennick of the energy tennick of the energy tennick of the energy tennick of the energy tennick of the energy tennick of the energy tennick of the energy tennick of the energy tennick of the energy tennick of the energy tennick of the energy tennick of the energy tennick of the energy tennick of the energy tennick of the energy tennick of the energy tennick of the energy tennick of the energy tennick of the energy tennick of the energy tennick of the energy tennick of the energy tennick of the energy tennick of the energy tennick of the energy tennick of the energy tennick of the energy tennick of the energy tennick of the energy tennick of the energy tennick of the energy tennick of the energy tennick of the energy tennick of the energy tennick of the energy tennick of the energy tennick of the energy tennick of the energy tennick of the energy tennick of the energy tennick of the energy tennick of the energy tennick of the energy tennick of the energy tennick of the energy tennick of the energy tennick of the energy tennick of the energy tennick of the energy tennick of the energy tennick of the energy tennick of the energy tennick of the energy tennick of the energy tennick of the energy tennick of the energy tennick of the energy tennick of the energy tennick of the energy tennick of the energy tennick of the energy tennick of the energy tennick of the energy tennick of the energy tennick of the energy tennick of the energy tennick of the energy tennick of the energy tennick of the energy tennick of the energy tennick of the energy tennick of the energy tennick of the energy tennick of the energy tennick of the energy tennick of the energy tennick of the energy tennick of the energy tennick of the energy tennick of the energy tennick of the energy tennick of the energ the second mine are the fine grain the last four are "flours" in addit the last four are "flours" in addition to these there are still fluor flours. These are especially fluo and used principally

In optical work About 50 per cent of all emery is washed with water and then 'blown' with a blower to remove the micaccou-assistates and other foreign matter. Em ery so treated of course costs more to produce, but this treatment results in a nure article—one whi 78 will cut more keenly and be more durable than

Viich improvement has taken place in the manufacture of emery in years, the principal innovation being the 'toucentrating' anchine through the use of a bich the curry is 'mulicd' This process also removes the micaceous assoclates and relicus the emery of low

The consumption of emery in this country for both grinding wheels and pollabing purposes, in 1909 was about 9000 short tons or 18003,000 pounds

Emry is a commodity in the man facturing world which is absolutely in dispensable and the use of it is con disjonators and the base of it is con-stantly increasing. There is no material for polishing purposes which could be successfully substituted for the reason that it is peculiarly fitted for this work. For polishing purposes corunding is too bard, on the other hand garnet, quarts, and flint are entirely unfitted—they lack that objected property of toughness which is possessed to a marked degree by

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600 horse-power is employed in electrochemical provesses 56,000 horse-power
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various industrial services Nearly 125,
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